MYSTERY AT SEA (p. 20) ~ **FATE OF THE POLAR BEARS** (p. 27)

Smithsonian

{ NOVEMBER 2007 }

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FROM THE EDITOR

Consequential

Cold winters, hot jaguars and a night to remember **BY CAREY WINFREY**

DAVID HALBERSTAM WROTE 21 BOOKS, including *The Best and the Brightest*, about the Vietnam War, and *The Powers That Be*, about the news media. But the author told friends he thought his latest, *The Coldest Winter*, about the Korean War, was his best ever. Sadly, it would also be his last. Halberstam was killed in April, at age 73, in an automobile accident in Menlo Park, California. Our excerpt ("Command Performance," p. 56) from the new book is about Gen. Matthew Ridgway, the no-nonsense Army commander credited with turning a tactical retreat into a counterattack that eventually drove masses of Chinese troops back across the 38th parallel and out of South Korea. It is classic Halberstam: authoritative, insightful, sweeping in its conclusions—and surprisingly resonant.

WHETHER AT *The New Republic*, where he was managing editor, or at *Fortune*, where he was a staff writer, Jeremy Kahn has long been interested in unintended consequences—especially those resulting from government policies. So the question of how heightened security at the United States-Mexico border might affect wildlife—in particular the jaguars recently documented in the United States—set him in motion (see "On the Prowl," p. 84): "As you get close to the border, you start seeing more and more Border Patrol and National Guard, and there's quite a lot of military and paramilitary activity, which I wasn't expecting." As for the jaguars, Kahn hopes there are more of them in the United States than the four or five photographed in the past decade. "I think for people who know about the jaguar, it does symbolize all that is still wild about the West."

SMITHSONIAN editor Carey Winfrey and Neil Hawkins of The Dow Chemical Company (in tuxedos) handed out plaques to 14 of "America's Young Innovators" at the National Museum of the American Indian, Sept. 15, 2007.

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LETTERS READERS RESPOND TO THE **SEPTEMBER** ISSUE

I really enjoyed "Washington & Lafayette," about the friendship between these two men. Lafayette had great admiration for the newly formed United States of America. Before he died, he arranged to have American soil taken from Bunker Hill and placed on top of his grave, and to this day an American flag flies at his grave site in Paris.

STEVE J. KAPP, GROVE, OKLAHOMA

FAST FRIENDS

JAMES R. GAINES never answers his own question of how the Marquis de Lafayette so quickly ingratiated himself with General Washington in August 1777. Gaines dismisses the father-son explanation as "unsatisfying" and then suggests that both men, being "aristocrats in a monarchy," had "the pursuit of fame" in common. That may be true, but it does not explain how Lafayette went from being yet another newly arrived and unsolicited volunteer to a member of Washington's inner circle in a month.

WILLIAM B. CLAYCOMB
HUGHESVILLE, MISSOURI

GAINES' ASSERTION that the victories in Trenton and Princeton were "militarily insignificant but symbolically critical" is questionable. Washington and his army had been chased out of New York and across New Jersey. The British were only about a one-day march behind the Americans: if they had caught up to them and forced battle, Washington's army would almost certainly have been destroyed. When Washington boldly crossed back into New Jersey to fight at Trenton, he destroyed a Hessian brigade and killed its commander. In the follow-up fighting at Princeton, he beat Cornwallis' rear element and consolidated the American situation to the degree that he and his army could then go into winter quarters in Morristown. Trenton and Princeton were indeed militarily important victories.

EMORY ALLEN BURTON
WASHINGTON, GEORGIA

RESTORING AFGHANISTAN

ALTHOUGH BILLIONS of dollars in international aid have been poured into rebuilding an Afghanistan shattered by years of war, Afghans remain mostly bystanders at projects planned and implemented by outsiders who come for a while, do their work and depart. Those of us who knew prewar Afghanistan and its historic culture can only cheer the modest but insightful efforts of Rory Stewart ("Undaunted") to help Afghan craftsmen save their traditional skills and restore their creative vitality for a future they will make for themselves.

ROSANNE KLASS
NEW YORK, NEW YORK

KEROUAC'S FLAT TIRE

"REMEMBERING Jack Kerouac" had me revisiting *On the Road*. Its outlook now seems very middle-class and adolescent, portraying the onset of the self-absorption or narcissism that has become increasingly typical. The Beats were so focused on indulging their feelings that they were unaware of the experiences of most ordinary people. Far from expanding human potential, Kerouac and others narrowed it to a self-indulgent obsession with kicks and drugs.

PETER HARTLEY
GOLDEN, COLORADO

CANNIBAL ART

Dozens of readers were dismayed that we didn't explain the admittedly bizarre 1641 painting of a largely naked Tapuya woman holding a severed human hand and hauling a basket in which a human foot can be seen ("When Portugal Ruled the Seas," p. 79). Well, here goes: the painting, by Albert Eckhout, for a while court painter to the governor of Dutch Brazil, appears to be an allegory of the ritualistic cannibalism that, according to some, was practiced by the Tapuya people of the Amazon. The German artist Zacharias Wagener, who resided in Dutch Brazil at the same time as Eckhout, wrote that Tapuyas did not bury a body but ate it in the belief that the dead were better off inside the living than left to "the heart of the dark land." —Ed.

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WILD THINGS

LIFE AS WE KNOW IT

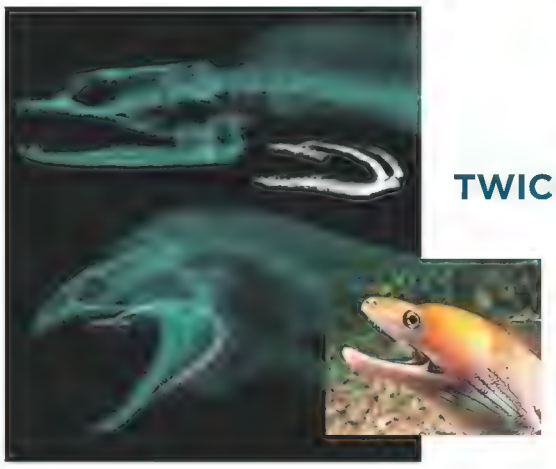
JESS BLUMBERG, T.A. FRAIL,
MEGAN GAMBINO AND LAURA HELMUTH

DEPT. OF DEFENSE

The oldest known case of chemical warfare was preserved in a drip of sap 100 million years ago. Researchers from Oregon State University and elsewhere found a soldier beetle encased in amber with a larger insect's antenna across its body—evidence of a possible attack. But the beetle had armed itself: sacs of fluid, probably toxic, protruded from its body, and one near the right shoulder had discharged. Many beetles still use this defense.

FATAL SWARM

To kill a hornet, Asian honeybees will mob it and generate so much heat that the hornet dies. But Cyprian honeybees fight with a type of hornet that is adapted to hot climates and can withstand such "thermo-balling." According to researchers in France and Greece, the Cyprian bees swarm the hornet's abdomen (inset) and block the breathing holes, called spiracles. Cause of the hornet's death? Suffocation. The scientists named the attack "asphyxia-balling."



TWICE BITTEN

Most fish use suction to gulp down prey. But new research shows that moray eels grab food with their jaws—and then launch a *second* set of jaws (tinted white in the X-ray) to pull prey into the esophagus. Researchers at the University of California at Davis speculate that the eels evolved the second set of mobile jaws because they live in narrow crevices and can't expand enough to generate suction.

BABY BABBLE

Female rhesus macaques use baby talk, say researchers who observed the interactions of 19 adult female monkeys on a small island off Puerto Rico. The monkeys made grunts and "girneys"—nasal whines—most often when an infant was present. The calls caught the infants' attention (much as human baby talk does) and also reassured the infants' mothers, who often allowed girneying females to hold their young.

Observed

NAME: *Loxodonta africana*, the African elephant.
THE ADVANTAGES OF AGE: The older a bull elephant gets, the more successful he is at siring calves, says a new study led by Duke University.
WHAT'S THEIR SECRET? Bull elephants grow nearly all their lives, and big bulls are dominant. Plus, older bulls spend more time in musth, a state of heightened sexual activity during which a bull has a greater chance of producing a calf than a bull not in musth.
AND THIS MEANS? Longevity might be bred into elephants—males with genes that help them live to old age are likely to pass on those genes.

Go to Smithsonian.com/wildthings to see an eel eating with its second jaws.

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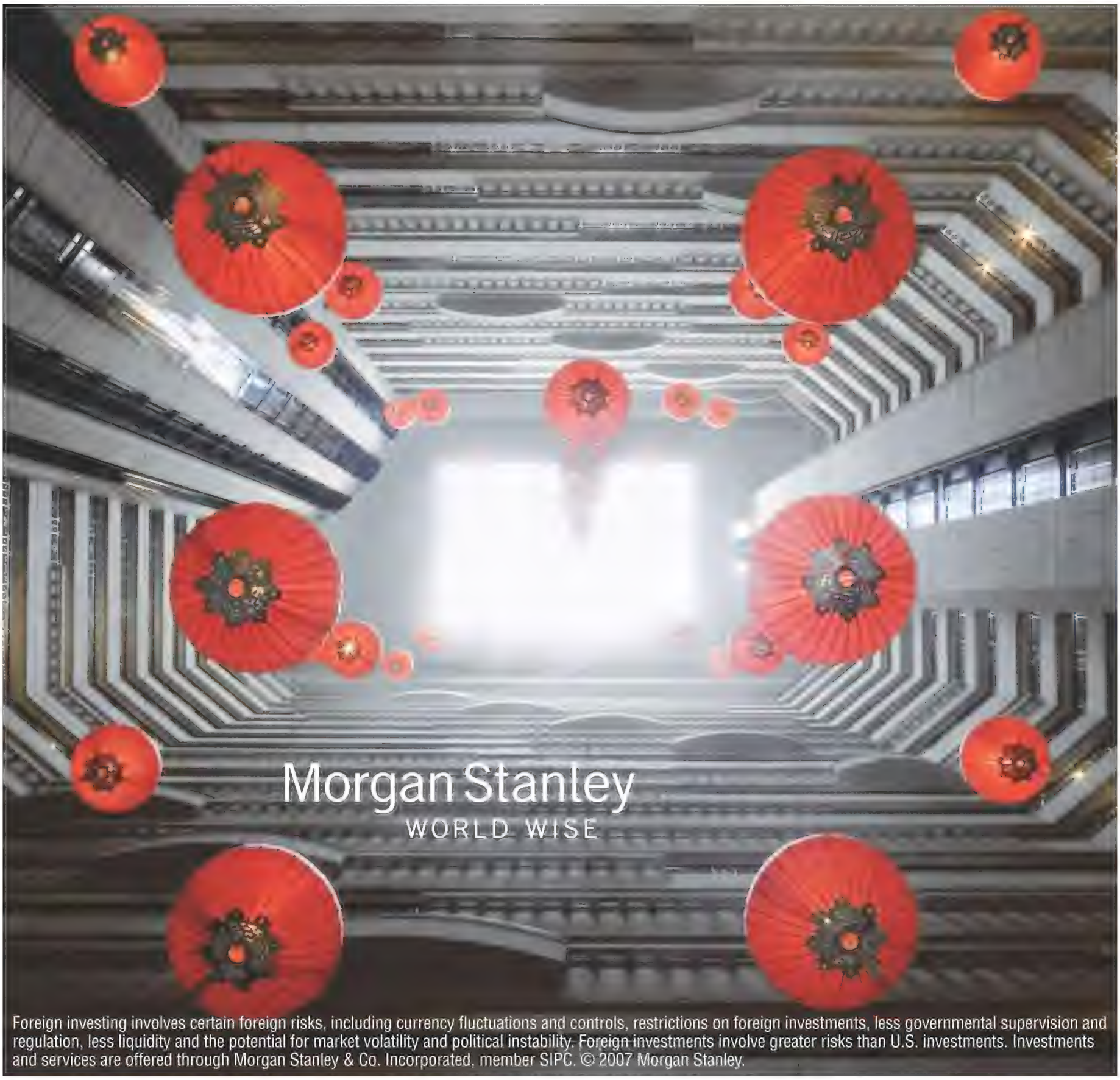

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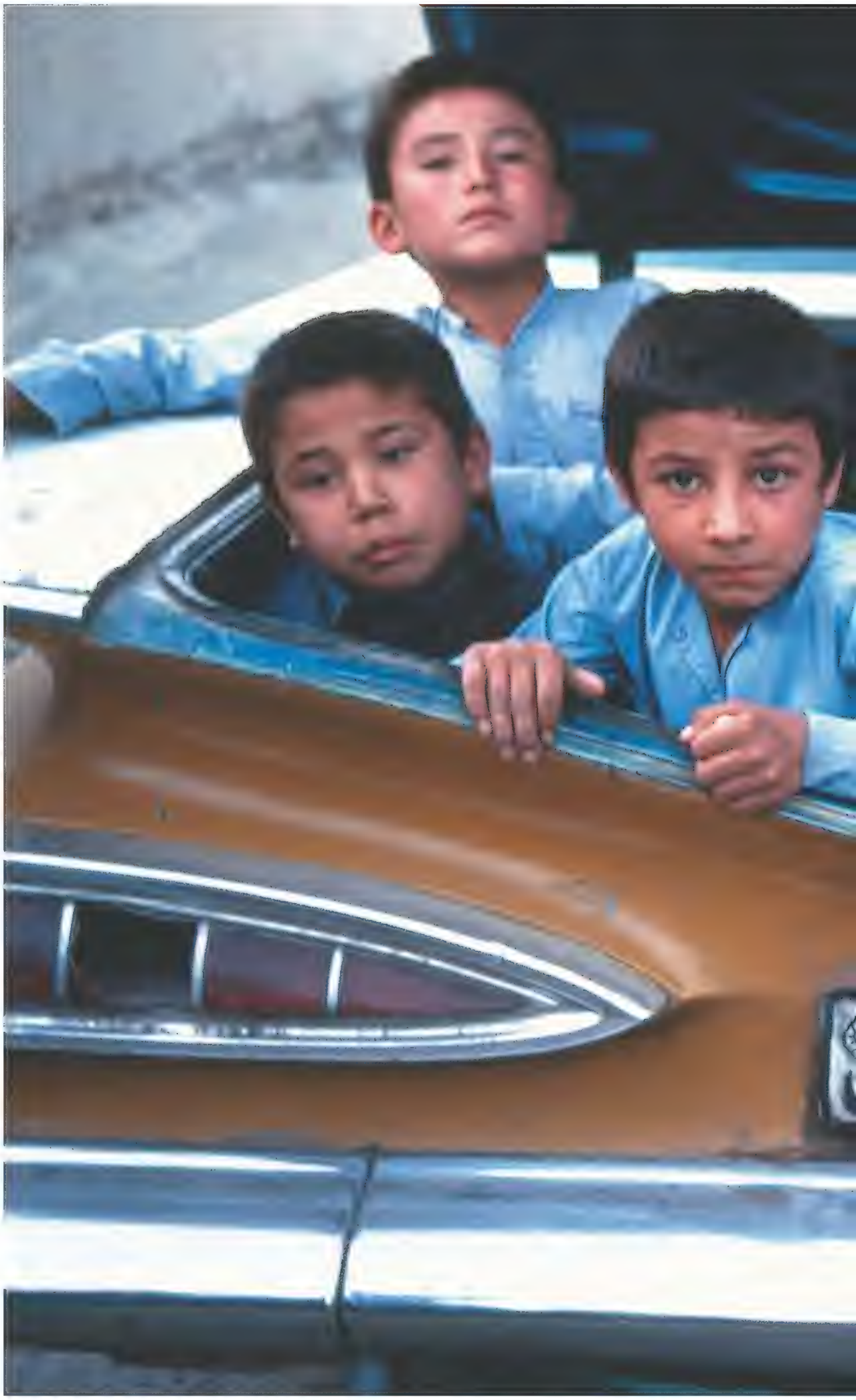
Trunk Show

Even in 1992, Steve McCurry says, Kabul was full of surprises

BY ROBERT M. POOLE



THE RELIC from 1959 was hard to miss. Painted taxicab yellow and battered by the years, the old Chevrolet came lumbering around a corner, cruised majestically down the faded brown streets of Kabul, Afghanistan, and swept past Steve McCurry.

Something about the vintage Chevy, so far from home, struck a chord with McCurry, an American photographer who, in 1992, had just returned to document the war-weary country's reawakening after almost a decade of Soviet occupation.

"It was so out of place. I couldn't believe it," recalls McCurry, whose new book on Afghanistan, *In the Shadows of Mountains*, includes portraits, landscapes and street photography he has made there over the past 30 years. He chased the taxi down the street, dodging turbaned pedestrians, donkey carts and squadrons of boxy Russian Volgas, but couldn't quite catch up. The taxi disappeared around a distant corner in a cloud of its own dust. McCurry made a mental note to keep his eyes peeled for the yellow Chevy.

"Within a couple of days, there it was again," he says, "and this time it was loaded with passengers." When he says "loaded" he means loaded: with public transportation scarce, Afghans

McCurry says he was fascinated because "a car with all this style . . . had become a completely utilitarian, functional machine."

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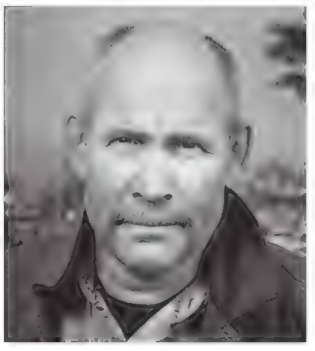
The combination of traditional dress and running shoes was part of the "incongruity" McCurry (below) says he saw in Kabul 1992.

made use of every square inch of a cab, first filling the seats inside, then piling into the trunk and, finally, squeezing onto the roof. "The trunk was full of those kids on their way home from school—nobody on the roof yet," McCurry says. He clicked off a few frames and the car rumbled off, taking its young passengers to an unknown fate.



McCurry didn't have time to get his subjects' names, but he did establish that they were from the Hazara community, a Shi'a Muslim minority often at odds with Afghanistan's dominant Pashtuns, who are largely Sunni Muslims. The independent-minded Hazara make up less than a quarter of the country's population. "They've always been an underdog minority, with other groups making jokes about them," McCurry says. "They used to have a good bit of autonomy in Kabul, but that changed when the Taliban took control in the mid-1990s. I've often wondered what happened to those kids I photographed in the trunk."

McCurry, 57, has been traveling the world virtually without pause since he graduated from Pennsylvania State University's College of Arts and Architecture in 1974. A member of the Magnum photo agency, he has covered conflicts in the former Yugoslavia, Beirut and the Persian Gulf and documented life throughout Asia. He has been to Afghanistan more than 30 times.

He first visited in 1979, on the eve of the Afghans' long war with the Soviets; he slipped across the border from Pakistan dressed as a native tribesman. "I had no visa that time," he recalls. "We literally walked in through the snows and up through the mountains for a look around." He came out the same way, with rolls of film sewn into his clothing. On subsequent forays, McCurry has traveled with mujaheddin fighters, warlords, herders, U.S. troops and others, occasionally ducking hostile fire. In 1992, when rockets started flying around Kabul, he plunged into the closest building he could find—an insane asylum.

"All the doctors and nurses had left," he says. "A few patients were killed. Others were completely undone—just scared to death by the experience. And some were totally oblivious to what was happening. For them it was just another day in Kabul."

Having seen Afghanistan through the Soviet occupation, fighting among warlords, Taliban rule and, now, American intervention, McCurry intends to return for the country's next phase—whatever it might be. "You think you have Afghanistan figured out, you turn the page, and the next chapter is more dramatic, more convoluted and more confusing than you ever imagined it could be," he says.

ROBERT M. POOLE *is a contributing editor at* SMITHSONIAN.

Visit Smithsonian.com/indelible to see more photographs from Steve McCurry's new book.

STEVE MCCURRY / MAGNUM; AHMET SEL; PP. 16-17 STEVE MCCURRY / MAGNUM

After the *Mary Celeste*'s ill-fated voyage, theories focused on everything from mutiny to pirates to sea monsters to waterspouts.

Abandoned Ship

What really happened aboard the *Mary Celeste*? More than a century after her crew went missing, a scenario is emerging **BY JESS BLUMBERG**

THE BRITISH BRIG *Dei Gratia* was about 400 miles east of the Azores on December 5, 1872, when crew members spotted a ship adrift in the choppy seas. Capt. David Morehouse was taken aback to discover that the unguided vessel was the *Mary Celeste*, which had left New York City eight days before him and should have already arrived in Genoa, Italy. He changed course to offer help.

Morehouse sent a boarding party to the ship. Belowdecks, the ship's charts had been tossed about, and the crewmen's belongings were still in their quarters. The ship's only lifeboat was missing, and one of its two pumps had been disassembled. Three and a half feet of water was sloshing in the ship's bottom, though the cargo of 1,701 barrels of industrial alcohol was largely intact. There was a six-month supply of food and water—but not a soul to consume it.

Thus was born one of the most durable mysteries in nautical history: What happened to the ten people who had sailed aboard the *Mary Celeste*? Through the decades, a lack of hard facts has only spurred speculation as to what might have taken place. Theories have ranged from mutiny to pirates to sea monsters to killer waterspouts. Arthur Conan Doyle's 1884 short story based on the case posited a capture by a vengeful ex-slave, a 1935 movie featured Bela Lugosi as a homicidal sailor. Now, a new investi-

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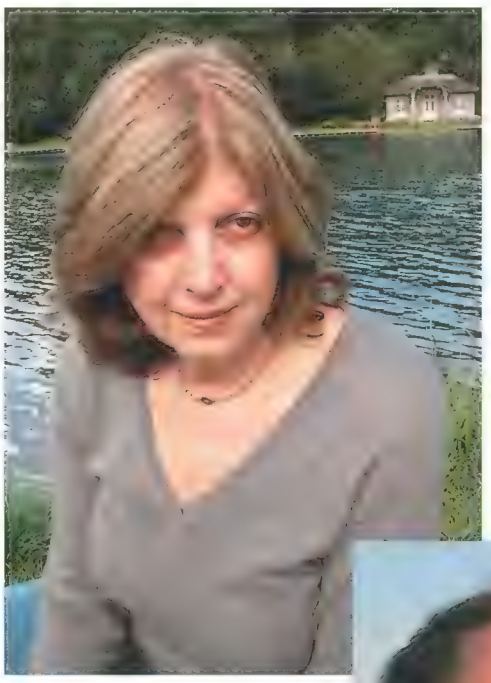
"There's so much nonsense written about this legend," says MacGregor. "I felt compelled to find the truth."

gation, drawing on modern maritime technology and newly discovered documents, has pieced together the most likely scenario.

"I love the idea of mysteries, but you should always revisit these things using knowledge that has since come to light," says Anne MacGregor, the documentarian who launched the investigation and wrote, directed and produced *The True Story of the 'Mary Celeste,'* partly with funding from Smithsonian Networks.

The ship began its fateful voyage on November 7, 1872, sailing with seven crewmen and Capt. Benjamin Spooner Briggs, his wife, Sarah, and the couple's 2-year-old daughter, Sophia. The 282-ton brigantine battled heavy weather for two weeks to reach the Azores, where the ship log's last entry was recorded at 5 a.m. on November 25.

After spotting the *Mary Celeste* ten days later, the *Dei Gratia* crewmen sailed the ship some 800 miles to Gibraltar, where a British vice admiralty court convened a salvage hearing, which was usually limited to determining whether the salvagers—in this case, the *Dei Gratia* crewmen—were entitled to payment from the ship's insurers. But the attorney general in charge of the inquiry, Frederick Solly-Flood, suspected mischief and investigated accordingly. After more than three months, the court found no evidence of foul play. Eventually, the salvagers received a payment, but only one-sixth of the $46,000 for which the ship and its cargo had been insured, suggesting that the authorities were not entirely convinced of the *Dei Gratia* crew's innocence.



Documentarian Anne MacGregor (above) and oceanographer Phil Richardson used historical weather data to plot the ship's course.

The story of the *Mary Celeste* might have drifted into history if Conan Doyle hadn't published "J. Habakuk Jephson's Statement" in 1884; his sensationalistic account, printed in *Cornhill Magazine*, set off waves of theorizing about the ship's fate. Even Attorney General Solly-Flood revisited the case, writing summaries of his interviews and notes. But the mystery remained unsolved.

MacGregor picked up the trail in 2002. "There's so much nonsense written about this legend," she said. "I felt compelled to find the truth."

JESS BLUMBERG *is an intern at* SMITHSONIAN.

MacGregor's four previous investigative documentaries, including *The Hindenburg Disaster: Probable Cause* (2001), applied modern forensic techniques to historical questions. "There are obvious limitations for historic cases," she says. "But using the latest technology, you can come to a different conclusion."

For her *Mary Celeste* film, MacGregor began by asking what *didn't* happen. Speculation concerning sea monsters was easy to dismiss. The ship's condition—intact and with full cargo—seemed to rule out pirates. One theory bandied about in the 19th century held that crew members drank the alcohol onboard and mutinied; after interviewing crewmen's descendants, MacGregor deemed that scenario unlikely. Another theory assumed that alcohol vapors expanded in the Azores heat and blew off the main hatch, prompting those aboard to fear an imminent explosion. But MacGregor notes that the boarding party found the main hatch secured and did not report smelling any fumes. True, she says, nine of the 1,701 barrels in the hold were empty, but the empty nine had been recorded as being made of red oak, not white oak like the others. Red oak is known to be a more porous wood and therefore more likely to leak.

As for that homicidal sailor played by Lugosi in *The Mystery of the Mary Celeste,* he may have been drawn from two German crewmen, brothers Volkert and Boye Lorenzen, who fell under suspicion because none of their personal possessions were found on the abandoned ship. But a Lorenzen descendant told MacGregor that the pair had lost their gear in a shipwreck earlier in 1872. "They had no motive," MacGregor says.

After ruling out what didn't happen, MacGregor confronted the question of what might have.

Abandoning a ship in the open sea is the last thing a captain would order and a sailor would do. But is that what Captain Briggs ordered? If so, why?

His ship was seaworthy. "It wasn't flooded or horribly damaged," says Phil Richardson, a physical oceanographer at the Woods Hole Oceanographic Institution in Massachusetts and an expert in derelict vessels, whom MacGregor en-

SCOTT MACGREGOR; DAVID MAGUIRE

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It seemed safe to assume that everyone abandoned ship soon after the last log entry was made. But why?

listed in her investigation. "The discovery crew sailed it, so it was in really good shape."

Briggs' life before the *Mary Celeste* offered no clues, says MacGregor, who visited the captain's hometown of Marion, Massachusetts, and interviewed descendants of Arthur Briggs, the 7-year-old son the Briggses had left behind so he could attend school. MacGregor learned that the captain was experienced and respected in shipping circles. "There was never a question that he would do something irrational," she says.

Did Briggs, then, have a rational reason to abandon ship? MacGregor figured that if she could determine the precise spot from which Briggs, his family and crew abandoned ship, she might be able to shed light on why. She knew from the transcriptions of the *Mary Celeste*'s log slate—where notations were made before they were transcribed into the log—that the ship was six miles from, and within sight of, the Azores island of Santa Maria on November 25; she knew from the testimony of the *Dei Gratia* crew that ten days later, the ship was some 400 miles east of the island. MacGregor asked Richardson "to work backward and create a path between these two points."

Bela Lugosi (seated) played a killer in *The Mystery of the Mary Celeste*.

Richardson said he would need water temperatures, wind speeds and wind directions at the time, data that MacGregor found in the International Comprehensive Ocean-Atmosphere Data Set (ICOADS), a database that stores global marine information from 1784 to 2007 and is used to study climate change. She, her yachtsman husband, Scott, and Richardson drew on the data to determine whether the *Mary Celeste* could have drifted from its recorded location on November 25 to where the *Dei Gratia* crew reported finding it on December 5. Their conclusion: yes, it could have, even without a crew to sail it. "We found out it basically just sailed itself," Richardson says.

At that point, MacGregor considered the fact that a captain would most likely order a ship abandoned within sight of land. Since Santa Maria was the last land for hundreds of miles, it seemed safe to assume that the *Mary Celeste* had been abandoned the morning of November 25, after the last log entry was written.

But why?

On this point, MacGregor says, Attorney General Solly-Flood's notes are crucial. He wrote that he saw nothing unusual about the voyage until the last five days, which is why he transcribed the ship's log starting five days from the end. The ship's log is believed to have been lost in 1885, so those transcriptions provided the only means for MacGregor and Richardson to plot the course and positions logged for the ship. The two then reconsidered those positions in light of ICOADS data and other information on sea conditions at the time. Their conclusion: Briggs was actually 120 miles west of where he thought he was, probably because of an inaccurate chronometer. By the captain's calculations, he should have sighted land three days earlier than he did.

Solly-Flood's notes yielded one other piece of information that MacGregor and Richardson consider significant: the day before he reached the Azores, Briggs changed course and headed north of Santa Maria Island, perhaps seeking haven.

The night before the last entry in the ship's log, the *Mary Celeste* again faced rough seas and winds of more than 35 knots. Still, MacGregor reasons, rough seas and a faulty chronometer wouldn't, by themselves, prompt an experienced captain to abandon ship. Was there something else?

MacGregor learned that on its previous voyage, the *Mary Celeste* had carried coal and that the ship had recently been extensively refitted. Coal dust and construction debris could have fouled the ship's pumps, which would explain the disassembled pump found on the *Mary Celeste*. With the pump inoperative, Briggs would not have known how much seawater was in his ship's hull, which was too fully packed for him to measure visually.

At that point, says MacGregor, Briggs—having come through rough weather, having finally and belatedly sighted land and having no way of determining whether his ship would sink—might well have issued an order to abandon ship.

But, like Attorney General Solly-Flood, MacGregor can't leave the story of the *Mary Celeste* alone; she is continuing her investigation for a book. "The research goes on," she says. "Because I have been touched by the story, as I hope other people will be."

The True Story of the 'Mary Celeste' *will première November 4 on the Smithsonian Channel on high-definition DirecTV.*

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For a clip of *The True Story of the 'Mary Celeste'* go to Smithsonian.com/phenom.

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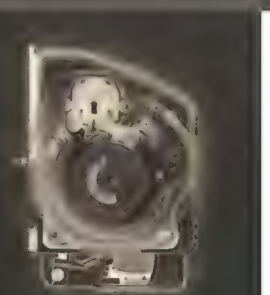

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INTERVIEW

STEVEN AMSTRUP

WILDLIFE BIOLOGIST, ANCHORAGE, ALASKA

A new study spotlights the plight of the polar bear, but there's still time to help the beloved creature **BY LAURA HELMUTH**

Because of global warming, the polar bear population is likely to shrink to one-third of its current size within 50 years, according to the United States Geological Survey (USGS). The report was coordinated by Steven Amstrup of the USGS Alaska Science Center.

YOU'VE BEEN STUDYING POLAR BEARS FOR 27 YEARS. WERE THEY IN TROUBLE WHEN YOU STARTED? No. At that time the big issue was making sure they were not overharvested. There had been a lot of trophy hunting and commercial harvest for hides, and Native people had always hunted them. In the 1970s, an agreement by the five polar nations [the United States, the Soviet Union, Canada, Norway and Denmark] got harvest under control.

WHY IS GLOBAL WARMING SO BAD FOR POLAR BEARS? They feed almost entirely from sea ice. They catch seals as they come up to breathe or climb onto the ice. This year set a new record for melting sea ice.

HAVE YOU SEEN MUCH CHANGE IN YOUR STUDY AREA? Most of my research is in the Beaufort Sea of northern Alaska. We have already seen major changes in habitat. The sea ice still freezes in winter, but it's retreating dramatically in the summer. Historically, polar bears followed the ice. Now they're forced to stay on land or follow the ice farther north, where there's less to eat.

WILL THEY ALSO HAVE TROUBLE BREEDING? My work suggests that polar bears typically build dens [where they raise their young] wherever they finish foraging at the end of the summer. It's not clear how far they have to be from historic denning areas before polar bears won't bother to return or won't be able to return.

THIS SUMMER, THE NORTHWEST PASSAGE OPENED UP FOR THE FIRST TIME IN HISTORY. IS THAT BAD FOR POLAR BEARS? It could be, if some of the remaining places where polar bears find sea ice are subjected to more human pressures from shipping. But the biggest concern is that sea ice has retreated far more than we thought it was going to. That the Northwest Passage is already open suggests sea ice models might be too conservative.

DO YOU EXPECT THE POLAR BEAR POPULATION TO KEEP SHRINKING? We looked only to the end of this century. And based on the best estimates of future sea ice, we forecast that there would still be polar bears remaining in the Canadian Arctic Islands. Humans caused the problem, and humans can fix the problem. We predict that there will be polar bears around to repopulate their territory if sea ice comes back. It's an expression of hope.

There's hope, says Amstrup (near Kaktovik, Alaska, with a male bear drugged so Amstrup could size it up and obtain blood for a population study).

DANIEL J. COX / POLARBEARSINTERNATIONAL.ORG

POINTS OF INTEREST

THIS MONTH'S GUIDE TO NOTABLE AMERICAN DESTINATIONS AND HAPPENINGS

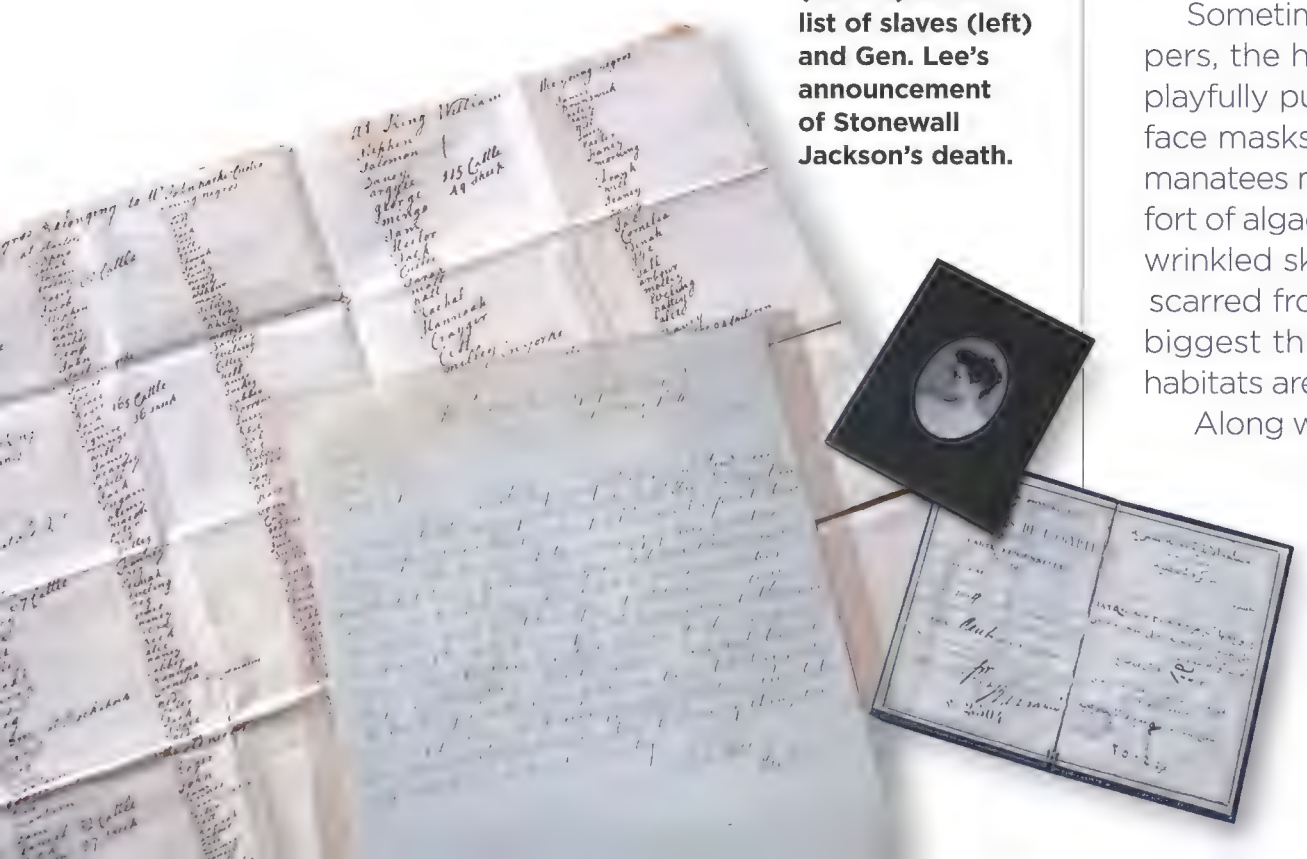
Confederate Daughter

RICHMOND, VIRGINIA—In November 2002, E. Hunt Burke, president of the Burke & Herbert Bank & Trust Company in Alexandria, Virginia, discovered a pair of old steamer trunks in the bank basement. The trunks, which had sat in a vault untouched for 85 years, were brimming with thousands of letters, photographs and items that Mary Custis Lee had stowed in 1917, the year before her death at age 83. In the cache, which included many trinkets and travel mementos, were two dozen letters from Mary's father, Robert E. Lee.

Among the finds, now open to the public at the Virginia Historical Society in Richmond, is a letter from General Lee written at a pivotal moment: May 1861, weeks after he had declined a senior command of the Union army and one day before he accepted a top position with Confederate forces. He writes to Mary about his eldest son, Custis—who'd expressed ambivalence about which side to take in the war—asking her to tell Custis to "consult his own judgment, reason & conscience, as to the course he may take. . . . If I have done wrong, let him do better."

Commenting on the loss of the family's Arlington plantation to Union troops, Lee consoles his daughter in a letter dated December 25, 1861: "In your houseless condition I hope you will make yourself contented & useful. Occupy yourself in aiding those more helpless than yourself."

Mary Custis Lee "was the family archivist," says Lee Shepard of the historical society. (Mary even saved three cloth stars cut from General Lee's Confederate uniform.) Some of the documents reflect the changing times. In an 1872 letter to Mary's mother, a former Lee slave writes that freedmen have settled on the Arlington property and that she herself is in "a comfortable home of my own." And a batch of 1902 newspaper clippings and papers recount a baffling incident in which Mary Custis Lee was arrested for sitting in the black section of a segregated Alexandria streetcar. { BY DAVID ZAX }



Mary Custis Lee (cameo) saved a list of slaves (left) and Gen. Lee's announcement of Stonewall Jackson's death.

Mingling with Manatees

CRYSTAL RIVER, FLORIDA—It's the only place in the country where people are allowed to get up close and personal with the gentle, refrigerator-size manatee. From November to March, as many as 400 West Indian manatees *(Trichechus manatus latirostris)* migrate from the Gulf to the warm freshwater springs of Crystal River, where the U.S. Fish and Wildlife Service allows swimming and snorkeling with the endangered sea mammals in areas near designated protective sanctuaries.

"It's not a petting zoo," says Jim Kraus, manager of the Crystal River National Wildlife Refuge, about 70 miles north of Tampa. "We promote passive observation. But we have not prohibited touching because many manatees often approach humans first."

Sometimes likened to huge potatoes with flippers, the homely grayish brown herbivores will playfully push their stiff whiskers into swimmers' face masks or barrel-roll for belly scratches. The manatees may be seeking relief from the discomfort of algae and barnacles attached to their thick, wrinkled skin, Kraus says. Their bodies are often scarred from collisions with boat propellers, the biggest threat to their survival. Some manatee habitats are also lost to algal bloom.

Along with conservationists, dive shop operators who lead manatee tours are very protective of the animals. If you go, expect to hear the rules for swimming with manatees—and stern warnings of fines and imprisonment if you break them. { BY BARBARA BEHRENDT }

STUART WESTMORLAND / CORBIS; COURTESY VIRGINIA HISTORICAL SOCIETY, RICHMOND, VIRGINIA

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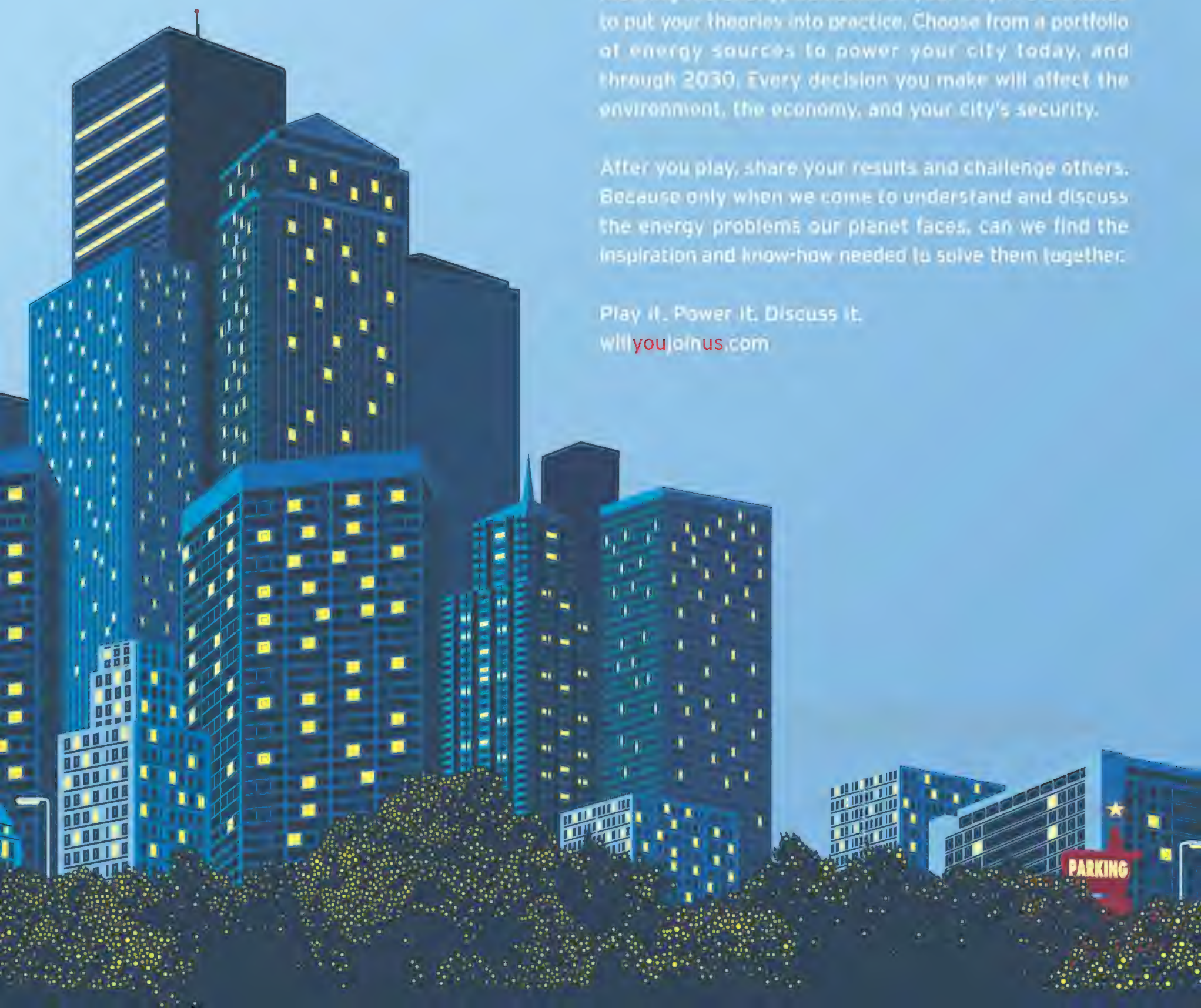

Strings Attached

INDEPENDENCE, MISSOURI— As puppet masters go, Hazelle Rollins isn't as well known as Shari Lewis or Jim Henson, but her contribution to the craft is the subject of the quirky Puppetry Arts Institute, a storefront museum a few miles from the Truman Presidential Library.

Rollins (1910-1984) was an art student when she started making and selling puppets out of her family's Kansas City, Missouri, basement in the early 1930s. Forty years later, her company, Hazelle, Inc., was the world's largest manufacturer of toy puppets, selling more than 250,000 a year. The most popular was a 15-inch marionette called Teto, an impish white-faced clown in a red-and-white polka-dot jumpsuit. Teto hangs out at the museum, along with Davy Crockett in faux buckskin and coonskin cap, Southern belles in floppy hats and a bejeweled beauty dubbed "Latin from Manhattan."

For $5, a visitor can assemble a puppet with parts from Rollins' factory, which closed in 1984. There are workshops in manipulating marionettes, and puppet shows. Kids enjoy this old-school virtual reality, but most visitors are adults. "Many say, 'I had that puppet,'" says director Diane Houk. "It touches something from their past." { BY MONICA WATROUS }

A Glass Ceiling to Love

TACOMA, WASHINGTON—Spanning Interstate 705, the 500-foot-long Chihuly Bridge of Glass connects the revitalized downtown area with the waterfront and the Museum of Glass, which commissioned the walkway from glass maestro (and Tacoma native) Dale Chihuly. For the roof that covers part of the bridge, Chihuly, inspired by the marine life in adjacent Puget Sound, mimicked a coral reef chockablock with anemones, eels, fronds, shells and a host of strange sea forms, all rendered in brilliantly colored glass. Halfway across the bridge, two 40-foot stacks of tangled ice-blue polyurethane chunks resemble rock candy on sticks; illuminated at night, they're visible from all around the city. Another section, called the Venetian Wall, is an 80-foot-long installation of fanciful Chihuly creations in individual showcases. Scores of colorful Art Deco-style objects, spiky floral arrangements and pudgy cherubs compel hurried pedestrians to slow their pace and linger a while. { BY DAVID WOLMAN }

A Holocaust Lesson, in Paper Clips

WHITWELL, TENNESSEE—This former coal-mining town (pop. 1,600) 15 miles from Chattanooga might seem an unlikely place for a Holocaust memorial. But on the grounds of the Whitwell Middle School sits a German rail car that transported Jews to Nazi concentration camps. It's piled high with 11 million paper clips, each one representing a victim of the Holocaust. Another 11 million paper clips fill an eight-foot-tall obelisk, which commemorates the Jewish children who died in the Czech village of Terezin. The Children's Holocaust Memorial, dedicated in 2001, had its origins in an after-school research project encouraged by principal Linda Hooper. When students learned that Norwegians in World War II wore paper clips on their collars to protest Nazi policies, the youths wrote friends, celebrities such as Steven Spielberg and politicians, asking for the clasps. German newspaper correspondents who heard about the initiative bought the 1917 "cattle" car from a museum in Germany and donated it to the school. A documentary film about the students' effort, *Paper Clips*, debuted in 2004. It's a "miracle of the human spirit that a community could understand and empathize with something that was so foreign to them," says Barbara Wind, the director of the Holocaust Council of MetroWest in New Jersey, who recently took a group of Holocaust survivors to the memorial. Laudatory correspondence from all over the world fills nearly 100 notebooks in the school library, but one binder bulges with hate mail from Nazi sympathizers. { BY NANCY HENDERSON }

COURTESY OF JOHN ROLLINS (SON OF HAZELLE ROLLINS); TERESA NOURI RISHEL; JOSH DURHAM

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THIS MONTH IN HISTORY

NOVEMBER ANNIVERSARIES
MOMENTOUS OR MERELY MEMORABLE

BY ALISON McLEAN

40 YEARS AGO STAR POWER

Astronomers Jocelyn Bell (above left) and Antony Hewish (right) discover the first pulsar—a pulsating, radio wave-emitting star—on November 28, 1967. Unsure at first of the source of the pulses, they call it LGM, for Little Green Men. It is later found to be a neutron star—a tiny, extremely dense star. Today more than 1,500 pulsars have been found (the Crab Nebula pulsar, above) using radio, optical, X-ray and gamma-ray telescopes. Hewish gets a Nobel Prize in 1974.

60 YEARS AGO HUGE FLYING BOAT SEEN OVER CALIFORNIA

Millionaire aviator Howard Hughes, 41, puts five years and $25 million to the test when he flies his 218-foot-long, 400,000-pound wooden plane for a mile over Long Beach harbor November 2, 1947. Dubbed the "Spruce Goose"—though it is mostly birch—the world's largest seaplane is designed to carry troops and equipment, but war's end and cost overruns make this its only airborne adventure.

60 YEARS AGO ROYAL REVEL

War-weary Britain toasts a happy future as Princess Elizabeth, 21, marries Lt. Philip Mountbatten of Greece, 26, in Westminster Abbey November 20, 1947. Their "I wills" are radio broadcast in 47 languages, while the first televised images of a royal wedding capture the couple emerging from the church. Among the 2,500 gifts is a turkey, sent by a 4-year-old Brooklyn girl. In 2007, Queen Elizabeth and Prince Philip become the first royal couple to reach their 60th anniversary.

175 YEARS AGO WOMAN'S WORK

Louisa May Alcott is born in Pennsylvania November 29, 1832. Schooled in Concord, Massachusetts, by her philosopher father and his friends Henry David Thoreau and Ralph Waldo Emerson, she begins writing for fun and continues as a way to earn money. After a stint as a Civil War nurse, she publishes *Little Women* in 1868, based on her life with her sisters. Three sequels and several similar books follow. The "most popular of American female authors," as the *New York Times* deems her, dies in 1888, age 55.

80 YEARS AGO COLD FUSION

Wisconsin inventor Carl Eliason patents the first snowmobile November 22, 1927. Earlier snow vehicles were modified cars; Eliason, working in his garage, turns bicycle parts, an outboard engine and a pair of skis into a "motor toboggan." Though often ranked with leaf blowers as supremely irritating noisemakers, in 2006 more than 160,000 snowmobiles are sold worldwide.

25 YEARS AGO HONORABLE MENTION

The Vietnam Veterans Memorial is dedicated in Washington, DC. November 13, 1982. Architect Maya Lin's black granite V, engraved with the names of 57,939 Americans killed and missing between 1959 and 1975 (since added to), is decried as a "black ditch" and hailed as overdue recognition. A statue of three servicemen is added in 1984 to honor the survivors; another, commemorating women's service, is added in 1993. "The Wall" now draws some 3.8 million visitors annually.

BRIAN SEED / ALAMY; NASA / AP IMAGES; AP IMAGES; KEYSTONE / GETTY IMAGES; GRANGER COLLECTION, NEW YORK; ELIASON SNOWMOBILES; WALLY MCNAMEE / CORBIS

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IMPORTANT SAFETY INFORMATION: LUNESTA works quickly, and should be taken right before bed. Be sure you have at least eight hours to devote to sleep before becoming active. Until you know how you'll react to prescription LUNESTA, you should not drive or operate machinery. Do not use alcohol while taking LUNESTA. Most sleep medicines carry some risk of dependency. Side effects may include unpleasant taste, headache, drowsiness and dizziness. See important patient information on the next page.

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Lunesta™ (eszopiclone) C-IV

1, 2 AND 3 MG TABLETS

Please read this summary of information about LUNESTA before you talk to your doctor or start using LUNESTA. It is not meant to take the place of your doctor's instructions. If you have any questions about LUNESTA tablets, be sure to ask your doctor or pharmacist.

LUNESTA is used to treat different types of sleep problems, such as difficulty in falling asleep, difficulty in maintaining sleep during the night, and waking up too early in the morning. Most people with insomnia have more than one of these problems. You should take LUNESTA immediately before going to bed because of the risk of falling.

LUNESTA belongs to a group of medicines known as "hypnotics" or, simply, sleep medicines. There are many different sleep medicines available to help people sleep better. Insomnia is often transient and intermittent. It usually requires treatment for only a short time, usually 7 to 10 days up to 2 weeks. If your insomnia does not improve after 7 to 10 days of treatment, see your doctor, because it may be a sign of an underlying condition. Some people have chronic sleep problems that may require more prolonged use of sleep medicine. However, you should not use these medicines for long periods without talking with your doctor about the risks and benefits of prolonged use.

Side Effects

All medicines have side effects. The most common side effects of sleep medicines are:

- Drowsiness
- Dizziness
- Lightheadedness
- Difficulty with coordination

Sleep medicines can make you sleepy during the day. How drowsy you feel depends upon how your body reacts to the medicine, which sleep medicine you are taking, and how large a dose your doctor has prescribed. Daytime drowsiness is best avoided by taking the lowest dose possible that will still help you sleep at night. Your doctor will work with you to find the dose of LUNESTA that is best for you. Some people taking LUNESTA have reported next-day sleepiness.

To manage these side effects while you are taking this medicine:

- When you first start taking LUNESTA or any other sleep medicine, until you know whether the medicine will still have some effect on you the next day, use extreme care while doing anything that requires complete alertness, such as driving a car, operating machinery, or piloting an aircraft.
- Do not drink alcohol when you are taking LUNESTA or any sleep medicine. Alcohol can increase the side effects of LUNESTA or any other sleep medicine.
- Do not take any other medicines without asking your doctor first. This includes medicines you can buy without a prescription. Some medicines can cause drowsiness and are best avoided while taking LUNESTA.
- Always take the exact dose of LUNESTA prescribed by your doctor. Never change your dose without talking to your doctor first.

Special Concerns

There are some special problems that may occur while taking sleep medicines.

Memory Problems

Sleep medicines may cause a special type of memory loss or "amnesia." When this occurs, a person may not remember what has happened for several hours after taking the medicine. This is usually not a problem since most people fall asleep after taking the medicine. Memory loss can be a problem, however, when sleep medicines are taken while traveling, such as during an airplane flight and the person wakes up before the effect of the medicine is gone. This has been called "traveler's amnesia." Memory problems have been reported rarely by patients taking LUNESTA in clinical studies. In most cases, memory problems can be avoided if you take LUNESTA only when you are able to get a full night of sleep before you need to be active again. Be sure to talk to your doctor if you think you are having memory problems.

Tolerance

When sleep medicines are used every night for more than a few weeks, they may lose their effectiveness in helping you sleep. This is known as "tolerance." Development of tolerance to LUNESTA was not observed in a clinical study of 6 months' duration. Insomnia is often transient and intermittent, and prolonged use of sleep medicines is generally not necessary. Some people, though, have chronic sleep problems that may require more prolonged use of sleep medicine. If your sleep problems continue, consult your doctor, who will determine whether other measures are needed to overcome your sleep problems.

Dependence

Sleep medicines can cause dependence in some people, especially when these medicines are used regularly for longer than a few weeks or at high doses. Dependence is the need to continue taking a medicine because stopping it is unpleasant.

When people develop dependence, stopping the medicine suddenly may cause unpleasant symptoms (see *Withdrawal* below). They may find they have to keep taking the medicine either at the prescribed dose or at increasing doses just to avoid withdrawal symptoms.

All people taking sleep medicines have some risk of becoming dependent on the medicine. However, people who have been dependent on alcohol or other drugs in the past may have a higher chance of becoming addicted to sleep medicines. This possibility must be considered before using these medicines for more than a few weeks. If you have been addicted to alcohol or drugs in the past, it is important to tell your doctor before starting LUNESTA or any sleep medicine.

Withdrawal

Withdrawal symptoms may occur when sleep medicines are stopped suddenly after being used daily for a long time. In some cases, these symptoms can occur even if the medicine has been used for only a week or two. In mild cases, withdrawal symptoms may include unpleasant feelings. In more severe cases, abdominal and muscle cramps, vomiting, sweating, shakiness, and, rarely, seizures may occur. These more severe withdrawal symptoms are very uncommon. Although withdrawal symptoms have not been observed in the relatively limited controlled trials experience with LUNESTA, there is, nevertheless, the risk of such events in association with the use of any sleep medicine.

Another problem that may occur when sleep medicines are stopped is known as "rebound insomnia." This means that a person may have more trouble sleeping the first few nights after the medicine is stopped than before starting the medicine. If you should experience rebound insomnia, do not get discouraged. This problem usually goes away on its own after 1 or 2 nights.

If you have been taking LUNESTA or any other sleep medicine for more than 1 or 2 weeks, do not stop taking it on your own. Always follow your doctor's directions.

Changes In Behavior And Thinking

Some people using sleep medicines have experienced unusual changes in their thinking and/or behavior. These effects are not common. However, they have included:

- More outgoing or aggressive behavior than normal
- Confusion
- Strange behavior
- Agitation
- Hallucinations
- Worsening of depression
- Suicidal thoughts

How often these effects occur depends on several factors, such as a person's general health, the use of other medicines, and which sleep medicine is being used. Clinical experience with LUNESTA suggests that it is rarely associated with these behavior changes.

It is also important to realize it is rarely clear whether these behavior changes are caused by the medicine, are caused by an illness, or have occurred on their own. In fact, sleep problems that do not improve may be due to illnesses that were present before the medicine was used. If you or your family notice any changes in your behavior, or if you have any unusual or disturbing thoughts, call your doctor immediately.

Pregnancy And Breastfeeding

Sleep medicines may cause sedation or other potential effects in the unborn baby when used during the last weeks of pregnancy. Be sure to tell your doctor if you are pregnant, if you are planning to become pregnant, or if you become pregnant while taking LUNESTA.

In addition, a very small amount of LUNESTA may be present in breast milk after use of the medication. The effects of very small amounts of LUNESTA on an infant are not known; therefore, as with all other prescription sleep medicines, it is recommended that you not take LUNESTA if you are breast-feeding a baby.

Safe Use Of Sleep Medicines

To ensure the safe and effective use of LUNESTA or any other sleep medicine, you should observe the following cautions:

1. LUNESTA is a prescription medicine and should be used ONLY as directed by your doctor. Follow your doctor's instructions about how to take, when to take, and how long to take LUNESTA.
2. Never use LUNESTA or any other sleep medicine for longer than directed by your doctor.
3. If you notice any unusual and/or disturbing thoughts or behavior during treatment with LUNESTA or any other sleep medicine, contact your doctor.
4. Tell your doctor about any medicines you may be taking, including medicines you may buy without a prescription and herbal preparations. You should also tell your doctor if you drink alcohol. DO NOT use alcohol while taking LUNESTA or any other sleep medicine.
5. Do not take LUNESTA unless you are able to get 8 or more hours of sleep before you must be active again.
6. Do not increase the prescribed dose of LUNESTA or any other sleep medicine unless instructed by your doctor.
7. When you first start taking LUNESTA or any other sleep medicine, until you know whether the medicine will still have some effect on you the next day, use extreme care while doing anything that requires complete alertness, such as driving a car, operating machinery, or piloting an aircraft.
8. Be aware that you may have more sleeping problems the first night or two after stopping any sleep medicine.
9. Be sure to tell your doctor if you are pregnant, if you are planning to become pregnant, if you become pregnant, or if you are breastfeeding a baby while taking LUNESTA.
10. As with all prescription medicines, never share LUNESTA or any other sleep medicine with anyone else. Always store LUNESTA or any other sleep medicine in the original container and out of reach of children.
11. Be sure to tell your doctor if you suffer from depression.
12. LUNESTA works very quickly. You should only take LUNESTA immediately before going to bed.
13. For LUNESTA to work best, you should not take it with or immediately after a high-fat, heavy meal.
14. Some people, such as older adults (i.e., ages 65 and over) and people with liver disease, should start with the lower dose (1 mg) of LUNESTA. Your doctor may choose to start therapy at 2 mg. In general, adults under age 65 should be treated with 2 or 3 mg.
15. Each tablet is a single dose; do not crush or break the tablet.

Note: This summary provides important information about LUNESTA. If you would like more information, ask your doctor or pharmacist to let you read the Prescribing Information and then discuss it with him or her.

Rx only

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Around the Mall

SCENES AND SIGHTINGS FROM THE SMITHSONIAN MUSEUMS AND BEYOND

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STEVEN G. SMITH / KLIXPIX

"I was proud to show that our Indian people are still doing this," Joyce Growing Thunder Fogarty says of her handiwork.

BEADING THE WAY

Made from elk skin and covered in countless blue and white beads sewed on one at a time, the dress is a highlight of the National Museum of the American Indian's "Identity by Design" exhibition, recently extended to August 2008. Perhaps the dress's most striking detail is the recurring image of a horse wearing a feathered war bonnet, and therein lies the story of Joyce Growing Thunder Fogarty and her ancestors.

{ CONTINUED ON PAGE 38 }

FROM THE CASTLE

Small World

BY CRISTIÁN SAMPER

TWO EXTRAORDINARY Smithsonian exhibitions help us understand the origins and tapestry of American diversity created by centuries of immigration and international exchange. "Encompassing the Globe: Portugal and the World in the 16th & 17th Centuries" was organized by the Arthur M. Sackler Gallery in partnership with the National Museum of African Art; it is now in Brussels through February 3. "Legacy: Spain and the United States in the Age of Independence, 1763-1848" is on view until mid-February at the National Portrait Gallery, which organized it in cooperation with the Smithsonian Latino Center, Spain's Sociedad Estatal para la Acción Cultural Exterior and the Fundación Consejo España-Estados Unidos (United States-Spain Council).

The first exhibition explains how the oceans served as the 16th century's worldwide Web, connecting Portugal's network of peoples, goods and information. Portuguese voyages prompted the first global interaction among many of the world's cultures and led to the creation of beautiful and highly original works of art. But progress often carries a darker side, and while these intrepid explorers mapped the known world, they also introduced disease and slavery.

During the Revolutionary War, Spain's Bernardo de Gálvez chose a propitious moment to distract the British Navy.

"Legacy" illuminates the relationship between Spain and the United States in the formative years of the American republic and underscores the influence of Hispanic culture and exploration in Florida, Louisiana, California and the Southwest. Portraits of key individuals, maps and documents highlight Spain's crucial financial and military contributions to the American Revolution. Paintings of George Washington, Benjamin Franklin and other founding fathers, and those of the Spanish king, Carlos III, and his ministers bring the story alive. A portrait of Louisiana governor Bernardo de Gálvez, commander of the forces that defeated the British at Pensacola in 1781, is appropriately prominent. That battle diverted the British Navy, an important factor in the American victory at Yorktown.

In 1763, France ceded New Orleans and its lands west of the Mississippi to Spain. During the nearly four decades that Spain governed this region—before Napoleon reacquired it—it left its mark, evident even today in street names (Carondelet, named after a Spanish governor) and landmarks (the Cabildo and St. Louis Cathedral, erected with a Spanish landowner's funds). The more our planet shrinks, the more we need to understand and celebrate the world's many cultures—endeavors that help us better know our own society and culture, and for which the Smithsonian is especially well suited.

CRISTIÁN SAMPER *is Acting Secretary of the Smithsonian Institution.*

For more pictures from the exhibitions, go to Smithsonian.com/castle.

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Making It Real

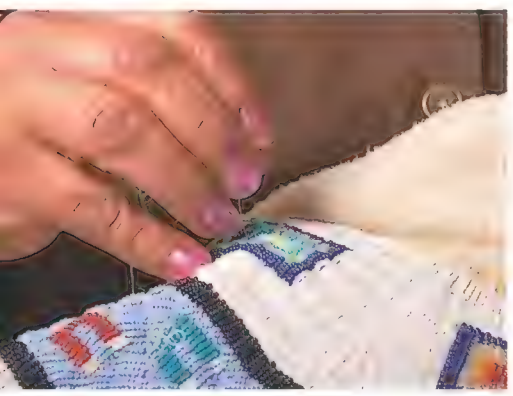
{ CONTINUED FROM PAGE 35 }

The Assiniboine/Sioux Indian is one of the West's most highly regarded beadworkers. She has created more than 500 dresses, cradle boards, dolls and other pieces, and has won top honors at the Southwestern Association for Indian Arts' annual show in Santa Fe three times—more than any other artist.

So Growing Thunder Fogarty, 57, was a natural for the "Identity by Design" exhibit, which showcases 55 Native American dresses and 200 accessories from the 1830s to the present. "We wanted to feature a contemporary woman who was keeping tradition alive today," says co-curator Emil Her Many Horses.

Thrilled by the museum's request, Growing Thunder Fogarty instantly had an idea for the design.

She had grown up on the Fort Peck Indian Reservation in Montana, where her grandfather Ben Gray Hawk, a tribal leader, performed a traditional "giveaway" ceremony. He would tie a war bonnet to a horse's head, sing a song paying tribute to loved ones and turn the horse loose into a crowd of men. Whoever caught the horse was able to keep it, an act of generosity meant to honor Gray Hawk's grandchildren.



"I watched my grandmothers do a lot of beadwork on the reservation," says Growing Thunder Fogarty, who worked 16 hours a day on her dress (above).

Thus Growing Thunder Fogarty's "Give Away Horses" dress, which she worked on every day for ten months, usually waking at 4 a.m. and beading at her kitchen table for 16 hours. She says she felt the spirit of her ancestors beading along with her. Her daughter, Juanita Growing Thunder Fogarty, and 18-year-old granddaughter, Jessica, who live in North San Juan, California, pitched in. Juanita made the breastplate, belt, knife case, awl case and bag for fire-starting tools; and Jessica made a beaded strip for the blanket. "We were constantly working," Juanita recalls. "Every now and then, I'd throw in a load of laundry, but we just kept at it."

The dress is Sioux-style, meaning the yoke (or cape) is completely covered in the small glass "seed" beads that Europeans introduced to Native artisans around 1840. (Originally, they made beads from shell, bone and stone.) The dress depicts not only horses and their tracks but also the rectangular drums used at the giveaway ceremony. Some of the accessories, such as the awl case (traditionally used to carry sewing tools), are seldom seen with modern Indian dresses. "I really wanted to make it real," Joyce says.

She had originally intended to give the dress to the museum, but curators arranged for a donor, Elaine Dee Barker, to underwrite some of the work, and therein lies another story about generosity and the past. For the last seven years, Joyce has lived in Socorro, New Mexico, but she used the commission this past September to buy a house on the Fort Peck Reservation where she was brought up. She now lives two doors down from her son and his family and is teaching a younger generation her craft. "She's gone home in a sense," daughter Juanita says. "And she's helping to preserve our traditions and keep our culture alive."

{ BY JESS BLUMBERG }

For an insider's look at the Smithsonian, visit Smithsonian.com/mallblog.

THE ROBESON SPIRIT The only known recording of Paul Robeson (1898-1976) singing "Let Us Break Bread Together on Our Knees" can be heard in the collection *On My Journey*, the first Smithsonian Folkways release in the African American Legacy series, co-presented by the National Museum of African American History and Culture. The legendary Robeson—athlete, lawyer, actor, singer, civil rights activist—made the recording at a friend's New York City apartment in 1955, when Robeson was being persecuted by the State Department, which revoked his passport for eight years beginning in 1950 because of his forceful criticism of racist U.S. policies. "Let Us Break Bread," an old spiritual, was an anthem of the Underground Railroad. { JB }

Visit Smithsonian.com/mall to listen to Paul Robeson.

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THE OBJECT AT HAND

Globe, c. 1840

NATIONAL AIR AND SPACE MUSEUM

SKY KING

Pan Am founder Juan Trippe turned Americans into frequent fliers

BY OWEN EDWARDS

AS A BOY, Juan Trippe had witnessed Wilbur Wright's 1909 flight around the Statue of Liberty; as a teenager, he learned to fly. In 1917, he left Yale to become a military pilot. He didn't see combat, but aviation continued to fascinate him after he returned to college. Trippe, who would found Pan American Airways in 1927, created a template for elegant air travel a world away from today's commercial airline system.

In Trippe's office in Manhattan's Chrysler Building, an antique globe held pride of place. The artifact, dating from the 1840s, was a family heirloom, bequeathed to Trippe by his father, an investment banker.

Trippe (with his wife, Elizabeth, c. 1947, top) gave up a promising Wall Street career to found an international airline (symbolized by his prized antique globe).

The globe represented far more than office décor; it symbolized one man's lofty ambitions. "Trippe wasn't a dictator, but he did want to take over the world," says F. Robert van der Linden, chair of aeronautics at the Smithsonian National Air and Space Museum (NASM). Indeed, Trippe consulted the globe as he conjured air routes. Today, the fabled orb has been installed at NASM as part of a new permanent exhibition, "America by Air," inaugurated this month.

Air battles and aerial bombing began in World War I, and some prescient military men saw a future for aircraft as weapons. But at the time Trippe graduated from Yale in 1921, few imagined the air as the ultimate highway for the traveling public. Trippe persuaded friends to invest in his dream; he then bought into an airmail delivery service in the Northeast, Colonial Air Transport. By 1927, he had merged three small air companies into Pan American Airways, to ferry passengers from Key West to Cuba. So began what would become the most glamorous airline ever to serve meals on real china.

The long routes that Pan Am pioneered required airplanes large enough to carry lots of fuel, but since there were few landing strips in Asia and South America long enough to handle big planes, Trippe bought Sikorsky seaplanes. In a poetic trope, he called the planes "clippers," after the fast sailing ships that had plied the oceans in the 19th century.

The comfort, speed and range of the clippers attracted movie stars and moguls, guaranteeing Pan Am press coverage and an aura of romance. In 1928, with an eye toward both practicality and publicity, Trippe hired Charles Lindbergh, one of the great heroes of the age,

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to help him pioneer new routes to South America, Japan and China.

In 1945, Pan Am became the first airline to introduce tourist class, cutting the New York to London fare by more than half and effectively launching the modern age of air travel. With his purchase of Boeing 707s in 1955, a risky gamble at the time, Trippe also ushered the jet age into being.

Trippe was married to Betty Stettinius; the couple had four children. He retired as chairman and CEO of Pan Am in 1968, and died in 1981, at age 81. Ten years later, his airline succumbed to a changing travel economy and rising fuel prices. When the airline's assets were sold off, Trippe's globe, says van der Linden, "became the property of the Pan

Alec Baldwin (with actual globe as prop) played Trippe in the film *The Aviator*.

Am Historical Foundation. Finally, it was agreed that the Air and Space Museum should have it."

As it turned out, the globe had one more role before it reached Washington. Director Martin Scorsese had cast Alec Baldwin in the role of Trippe for his film *The Aviator*, the 2004 Howard Hughes biopic. Scorsese, a stickler for accuracy, wanted Baldwin to consult Trippe's actual globe, not a facsimile. So it was that, after its cameo, the artifact was carefully packed and shipped to Washington, D.C., where it stands today alongside one of the original three-blade propellers from the China Clipper. Juan's world . . . delivered.

OWEN EDWARDS *is a freelance writer and author of the book* Elegant Solutions.

Q&A

CHIP KIDD, a graphic designer and author, received a 2007 Cooper-Hewitt National Design Award for one of his innovative book covers. He spoke with the magazine's Jess Blumberg.

YOU'VE DESIGNED SOME 1,000 BOOK COVERS. HOW DO YOU KEEP THEM UNIQUE? I depend on the writers to not write stale books. I get a sense from reading the manuscript that the writer is doing a really good job, so that kind of cheers me on to do the same visually.

WHAT IDEAS DO YOU TRY TO STEER CLEAR OF IN YOUR BOOK DESIGNS? I try to avoid something that's literal. I did a cover several years ago for the novel *My Name Is Red* by Orhan Pamuk. The title is in blue. But of course rules were made to be broken. I did Cormac McCarthy's *All the Pretty Horses*, and what's on the cover? A pretty horse. But it was showing just the mane, not the entire body, as if the horse became a part of the landscape.

WHAT BOOK BEFORE YOUR TIME WOULD YOU HAVE LIKED TO DESIGN THE COVER FOR? *The Catcher in the Rye*. There's a final scene with a carousel in Central Park, so the original design is a very stylized, very of-its-time [1951] drawing of a carousel horse. I think I would try and represent Phoebe somehow, but again, not in a literal way.

WILL BOOKS BECOME OBSOLETE WITH DIGITAL TECHNOLOGY? I love this question because it gives me the chance to reiterate for the umpteenth time: No, the book is not going anywhere. The book is already the most concise piece of technology to deliver what it delivers. When the last "Harry Potter" book came out, kids weren't downloading it. They were lining up at bookstores. People like something they can pop into their bag. People didn't carry their *Sgt. Pepper* album all over the place—they would go home and listen to it.

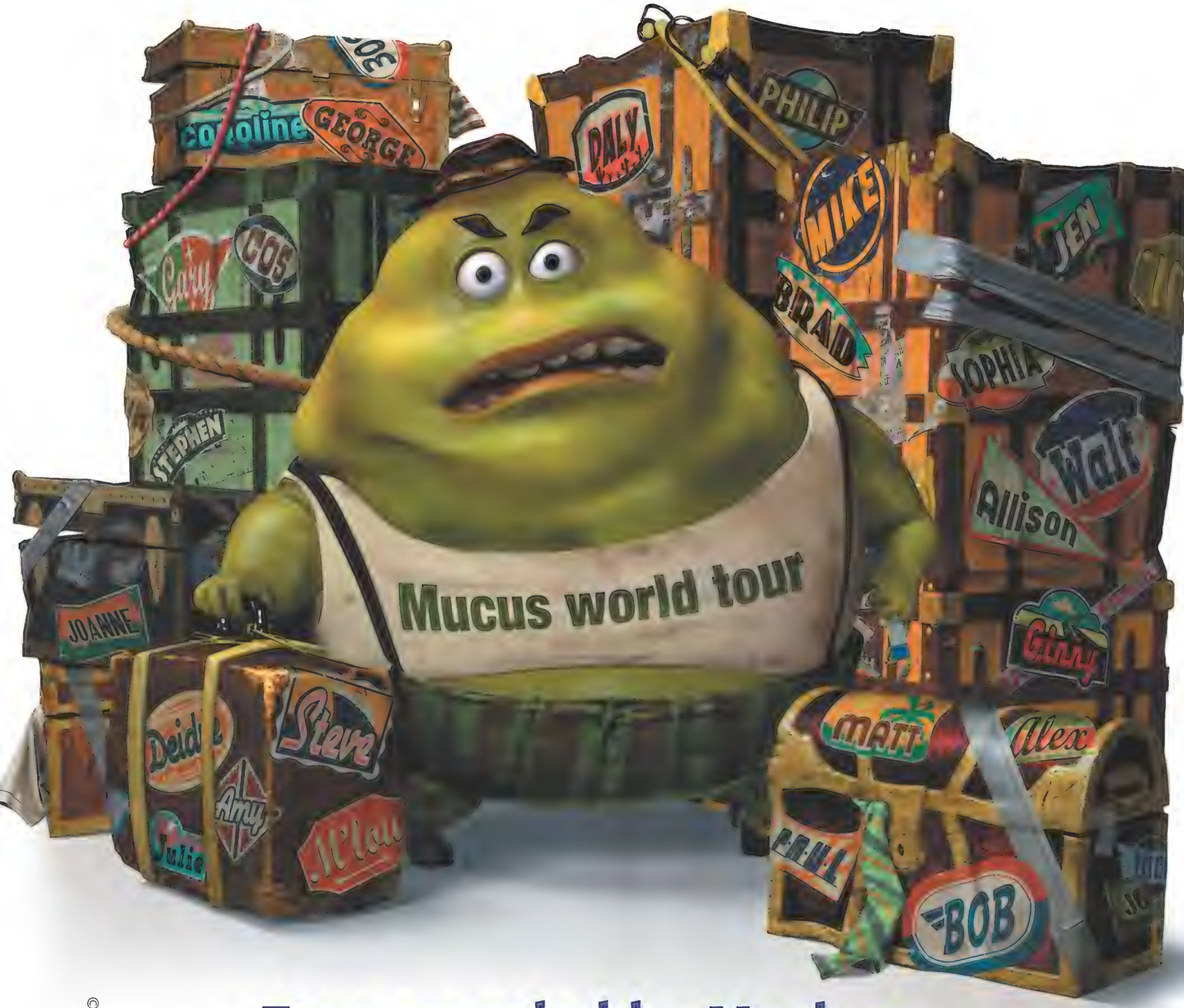
WHAT DO YOU SAY TO THE AXIOM "DON'T JUDGE A BOOK BY ITS COVER"? My reaction is, Oh, go ahead.

Visit Smithsonian.com/mall to read more of our Chip Kidd interview.

News Flash

All the gaudy lights for which New York City's Times Square is known can be traced to an Election Day marvel, Smithsonian archivist Darcy Tell explains in her new book, *Times Square Spectacular* (HarperCollins). On November 7, 1904, the *New York Times* said it would announce the presidential election results using a searchlight atop the paper's 24-story headquarters at 42nd Street and Broadway. If the beam pointed east, the next president would be Alton B. Parker. Instead, it pointed west, meaning Theodore Roosevelt would stay in office (right, signaling Taft's election in 1908). The feat, Tell writes, "helped cement Times Square's association with bright, carnival-style lights." The place is still called Times Square, though the *Times* itself moved to 43rd Street in 1913 and to Eighth Avenue this year. { JB }

MICHAEL FALCO / THE NEW YORK TIMES / REDUX; CONTENT MINE INTERNATIONAL / ALAMY; BROWN BROTHERS / SI BOOKS



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What's Up

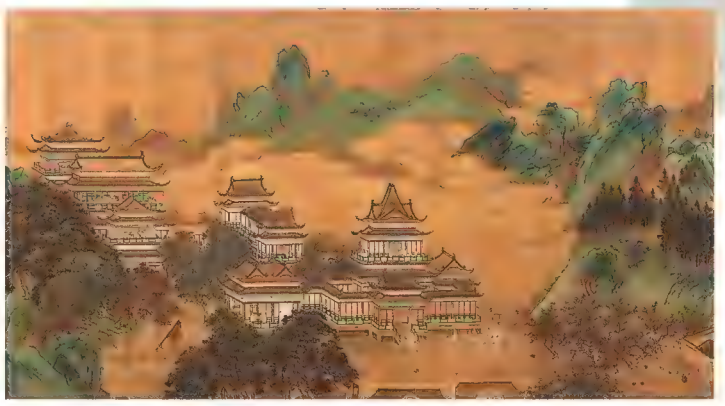
CLOSE ENCOUNTER Paris-based Romanian artist Mircea Cantor put a live deer and a live wolf in a small gallery and filmed the result. (No, the wolf doesn't attack.) His 2005 *Deeparture* is at the Hirshhorn until December 9.

PATRIOT ACTS

After World War II, government-issued "victory" and "liberty" bonds reduced the $30 billion-plus war debt by two-thirds. Rally around 45 rousing posters at American Art through February 3.

ART IMITATES LIT

Chinese artworks inspired by classic literature, poems and mythology—and dating from the first century to the present day (below, *The Peach Festival of the Queen Mother*, a c. 17th- to 18th-century scroll)—are at the Freer Gallery through January 13.



KATE THE GREAT

For the centennial of Katharine Hepburn's birth (she died in 2004), the Portrait Gallery has paintings (Everett Raymond Kinstler's 1982 oil), film clips and her unrivaled four Oscars for Best Actress. Starting November 2.

SUN GODS AND POP STARS

Where else will you find pre-Columbian artworks (Aztec bells, c. 1325 to 1521) and sexy outfits worn by the Tex-Mex music star Selena? Spotlighting Mexican culture, the Latino Center showcases 126 objects from 8 Smithsonian museums at the Ripley Center until November 11.

{ BY JESS BLUMBERG }

VISIT THE SMITHSONIAN For a free Associates' planning packet, call 202 633-1000 or 202 633-5285 (TTY), 9 a.m. to 5 p.m. Monday through Friday and 9 a.m. to 4 p.m. Saturday. Or send an e-mail to info@si.edu. The Smithsonian Information Center in the Castle is open daily, 8:30 a.m. to 5:30 p.m. Members can visit the reception desk between 9 a.m. and 4 p.m. to register for a behind-the-scenes tour and to hear about membership benefits. Most museums are open daily, 10 a.m. to 5:30 p.m. All museums are closed December 25.

Visit Smithsonian.com/whatsup for a complete list of events and exhibitions.

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UNEARTHING EGYPT'S GREATEST TEMPLE

Archaeologists are finally grasping the true grandeur of the monument built 3,400 years ago by Pharaoh Amenhotep III

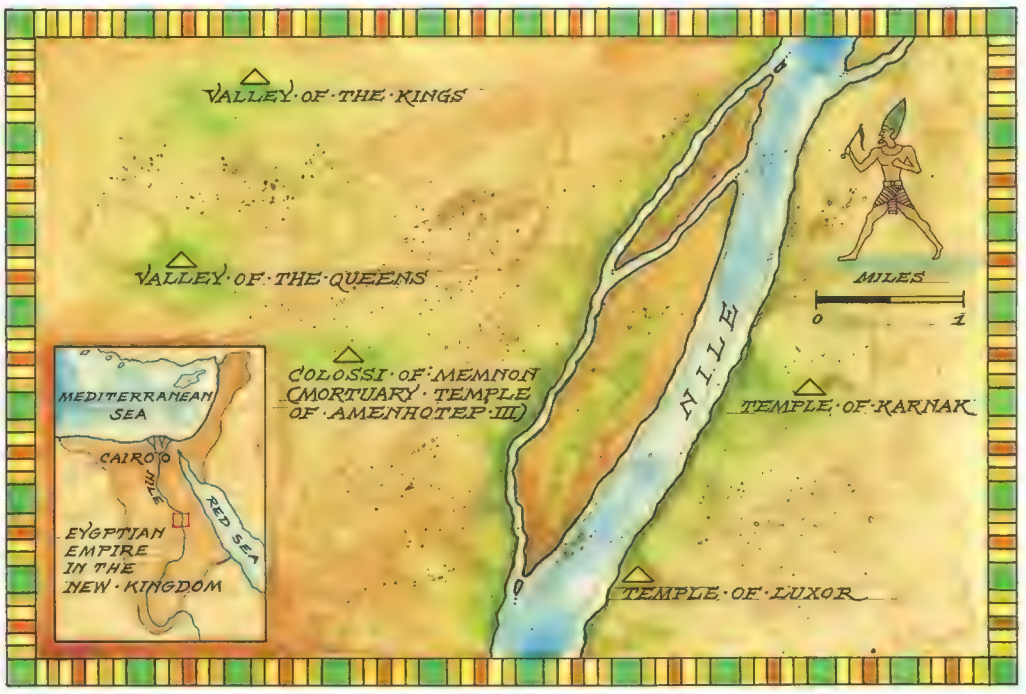
BY ANDREW LAWLER

Earthquakes, looting and Nile floods obscured much of ruler Amenhotep III's temple until archaeologists embarked on a massive excavation there in 1999. (About one-eighth of the site is visible here; the standing slab—reconstructed in the 1950s—marks the entrance to the colonnaded sun court). Statues of the goddess Sekhmet (left)—730 of them in all—stood guard over the complex.

© MEMNON AMENHOTEP III PROJECT; MAP: MIKE REAGAN; P. 49 © MEMNON AMENHOTEP III PROJECT; P. 46 ALADIN ABDEL NABY / REUTERS; PP. 46-47 SANCHO GONZÁLEZ-GREEN / © MEMNON AMENHOTEP III PROJECT

"HEYA HUP!" Deep in a muddy pit, a dozen workers wrestle with Egypt's fearsome lion goddess, struggling to raise her into the sunlight for the first time in more than 3,000 years. She is Sekhmet—"the one who is powerful"—the embodiment of the fiery eye of the sun god Ra, but now she is caked in dirt and bound by thick rope. As the workers heave her out of the pit and onto a wooden track, the sand shifts and the six-foot-tall granite statue threatens to topple. A half-dozen men in ankle-length robes grab the taut ropes, again shout the Arabic equivalent of "heave, ho!" and steady her just in time.

Within the hour, the seated Sekhmet is once again imperious: her breath creates the desert wind, her anger feeds on disease and war, and her power protects mighty pharaohs. Or did. This long-buried statue is one of 730—one for every day and night of the year—that guarded a vast collection of gates, colonnades, courts and halls built by the great Egyptian king Amenhotep III, who reigned over Egypt for 38 years in the 14th century B.C., at the height of peace and prosperity. In its day, "The House of Millions of Years" was the largest and most impressive temple complex in the world. But it was no match for earthquakes, fires, floods or Amenhotep III's successors, who scavenged



Archaeologists assumed that the great temple had been stripped of all statues—excepting the two "Colossi of Memnon" (on cover)—that hadn't been destroyed. In reality, beautifully worked statues of Sekhmet (below and left) survived for 3,400 years. Now, underground artifacts face a new danger: irrigation water is eating away at treasures buried near the Nile.

stone blocks and statues for their own temples. Much of the site, near the Valley of the Kings along the west bank of the Nile River, is covered with sugar cane.

Hourig Sourouzian, an Armenian archaeologist, is directing the effort to rescue the long-neglected site and its many statues. "They didn't deserve this treatment!" she says as a worker hoses off the mud and salt coating a Sekhmet lined up with a dozen similar statues in the bright sun.

Egyptologists had long assumed that all that remained of the temple complex were the imposing Colossi of Memnon, two seated statues of Amenhotep III at the entrance to his temple, and some stones and fragments of statuary. Sourouzian had been working at a neighboring temple, Merentptah, from which she would visit the Amenhotep complex. "I was always interested in the fragmented statuary of the site and dreamed about seeing them reconstructed instead of lying in vegetation, water and junk," she recalls. Then, in 1996, a brush fire swept over the area, charring the stones and fragments and making them more vulnerable to cracking and erosion. When Sourouzian and her husband, German archaeologist Rainier Stadelmann, surveyed the damage, she says, "It was terrible and depressing, and we swore to take action."

Archaeologist Hourig Sourouzian (in 2004, with a statue of Queen Tye just above the rising water line) "swore to take action" against the temple's damage.

First, she convinced the World Monuments Fund in 1998 to designate the temple one of the world's "100 Most Endangered Sites" and fund the initial conservation area of the shattered fragments aboveground. During the course of that effort, Sourouzian began to suspect that there was more to be found underground. By 2000, however, the money had run out, and she and Stadelmann reluctantly began to wrap up their work. But a wealthy French woman who had attended a lecture by Sourouzian in Paris agreed to fund a more ambitious excavation. Within a year, the team began to uncover their first statues, and the archaeologists realized that many treasures still lay beneath the dirt.

Born in Baghdad to parents of Armenian descent, Sourouzian grew up in Beirut and studied art history at the Sorbonne in Paris. Sent to Karnak by the Louvre, she became one of the leading authorities on Egyptian royal statuary. "She's probably the best Egyptian art historian of our time," says Betsy Bryan, an Egyptologist at Johns Hopkins University. Now, along with Stadelmann, who once headed the German Archaeological Institute in Cairo, Sourouzian orchestrates a team of two dozen specialists from around the world—including French, Swiss, German, Spanish and Japanese researchers—and as many as 400 local workers.

What began modestly has become one of the most ambitious projects Egypt has seen in decades, bringing to light a triumph of engineering and art that once dwarfed even the massive Karnak and Luxor temples across the Nile. Amenhotep III called the complex "a fortress of eternity out of good white sandstone—worked with gold throughout. Its floors were purified with silver, all of its doorways were of electrum," an alloy of gold and silver.

The recently liberated Sekhmet statue is one of 72 of the goddess that Sourouzian and her team have discovered. They've also found two huge statues of Amenhotep III, each flanked by a smaller one of Queen Tye and a menagerie of sacred animals, including an alabaster hippopotamus. The project is giving Egyptologists a fresh look at the mysterious temple culture that dominated ancient life here, in which hordes of priests conducted rituals, made offerings and administered the intricate rites designed to ensure the eternal well-being of the dead pharaoh.

Once brightly painted in blues, reds, greens, yellows and whites, the 50-foot colossi in front of the massive first gate, or pylon, loomed over the Nile Valley's flat farmland, facing the brown river that then flowed just a few hundred yards away. While the rest of the complex collapsed and crumbled, the stately statues remained. Cracks caused by an earthquake in 27 B.C. made one of the statues produce an odd tone when the morning sun struck it. A contemporary named Pausanias described the sound in his *Guide to Greece* as "very like the twang of a broken lyre-string or a broken harp-string." The site quickly became one of the ancient world's biggest tourist attractions; even the Roman emperor Hadrian came to hear it in

ANDREW LAWLER *has written about Alexandria, Petra and a newfound tomb in the Valley of the Kings for* SMITHSONIAN.

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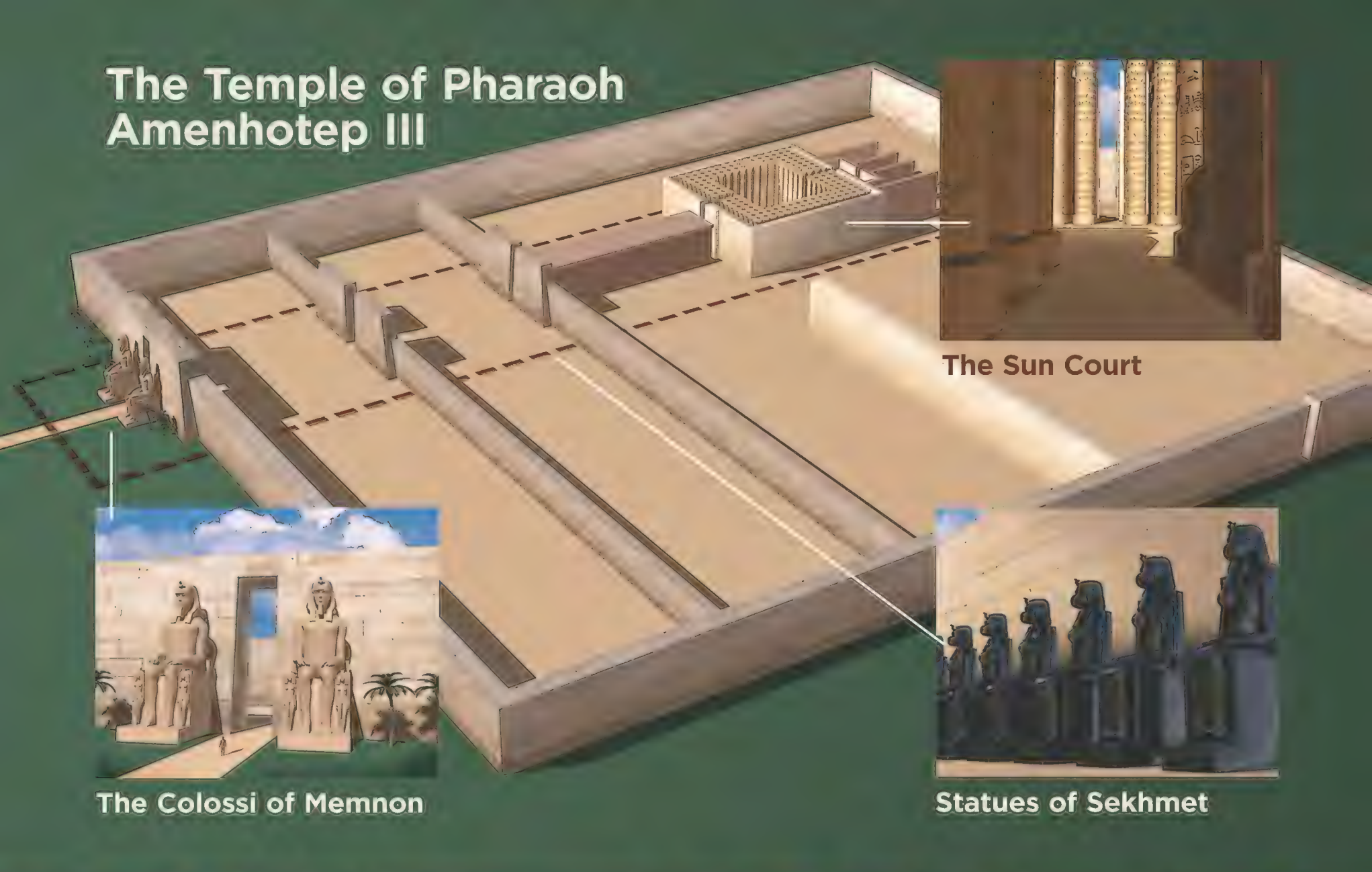
The Temple of Pharaoh Amenhotep III



The Sun Court

The Colossi of Memnon

Statues of Sekhmet

Today much of the temple complex, which was almost as large as Vatican City, is covered with sugar cane fields, and Sourouzian's team has only begun to excavate an exposed strip through its center. (The 50-foot-tall Colossi of Memnon, below left, face the Nile.) The temple (an artist's conception, above; the dotted line indicates the present excavation) had at least three main gates, a central sun court (the right-most side of the excavation below) and, according to one expert, "probably the highest-quality art Egypt ever made."

Archaeologists working at the site hope not only to rescue and study the temple but also to reconstruct as much of it as possible. They are planning to piece together and re-erect 25 large statues of Amenhotep III that stood in the sun court (above) between columns almost 50 feet high.

A.D. 130. Alas, it was inadvertently silenced during restoration work in A.D. 199.

On a hot morning, visiting American archaeologists and art conservators spill out of a crowded van. Sourouzian leads them into a storeroom the length of a railroad car, and the visitors marvel at the Sekhmets, a giant head of the pharaoh, and bits and pieces of unidentified faces in neat rows—fresh finds from Sourouzian's team. "She's Isis reassembling Osiris," says the University of Chicago archaeologist Ray Johnson, of Sourouzian, likening her to the goddess who recovers dismembered pieces of her lover and restores him to life.

FEW BUILDING SPREES in history can match that of Amenhotep III, and few pharaohs' lives are so well documented—even his birth is commemorated in stone reliefs at Luxor. He came to the throne before his teens, at the death of his warrior father Thutmose IV. His grandfather and father had expelled Mesopotamian invaders known as the Mitanni. The young pharaoh quelled an uprising in Nubia at the southern fringe of his empire—chopping off the right hands of 312 enemies—but turned to diplomacy for the rest of his reign.

His principal wife, Tye, was from a noble Egyptian family, but Amenhotep III's harem grew to include princesses from great powers such as Babylon and Mitanni—a common method of cementing alliances in the ancient world, but unusual for Egypt, whose rulers tended to disdain foreigners. He also maintained regular correspondence with other kings. Letters written in Mesopotamian cuneiform found at Amarna, the capital built by his son Akhenaten, reveal a canny leader who preferred words to weapons.

The peace that Amenhotep III worked hard to preserve brought a boom in international trade, with partners from throughout the Mediterranean, across Western Asia and deep into Africa—thanks in part to Egypt's many gold mines. "Gold in your country is dirt; one simply gathers it up," wrote an obviously envious Assyrian king. The pharaoh used his wealth to transform the nation into an imperial showplace. He ordered temples built from the Nile Delta in the north to Nubia 800 miles to the south. Under his patronage, artists experimented with new styles of sculpture and reliefs carved into temple walls. Traditional rudimentary forms became elegant and sophisticated, and the carvings reveal more attention to craft and detail. It was "probably the highest-quality art Egypt ever made," says Johns Hopkins' Betsy Bryan. "The man had taste!"

Amenhotep III reserved the greatest works for his hometown, Thebes, today's Luxor. During most of the so-called New Kingdom, which lasted from 1570 B.C. to 1070 B.C., pharaohs resided at Memphis, a cosmopolitan city near today's Cairo. But as Amenhotep III grew older, he spent more and more time in Thebes, turning it into one

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vast religious center spanning both sides of the Nile. Large additions were made to the Karnak and Luxor temples on the Nile's east bank, both of which had begun as small Middle Kingdom sanctuaries. Across the river, Amenhotep III built a huge harbor and an adjacent palace with colorfully painted walls, as well as his extensive funerary temple.

It was this great temple, rather than his hidden tomb in the Valley of the Kings, that Amenhotep III counted on to ensure his soul's journey to the afterlife—and, no doubt, inspire awe among the living. Stretching seven football fields in length from the colossi at the main entrance, which faced east to the Nile, to sacred altars pointing toward the Valley of the Kings in the west, the complex covered an area nearly the size of Vatican City. In its day, it was the largest and one of the most ornate religious structures in the world, filled with hundreds of statues, stone reliefs and inscriptions set among colonnaded plazas. Colorful royal banners flapped from cedar poles shimmering in gold leaf and secured on red granite pedestals at pylons, or massive gateways, that led into innumerable sanctuaries.

Such an awesome sight is hard to envision today. In addition to an earthquake a century or so after Amenhotep III's

Rebellious Son

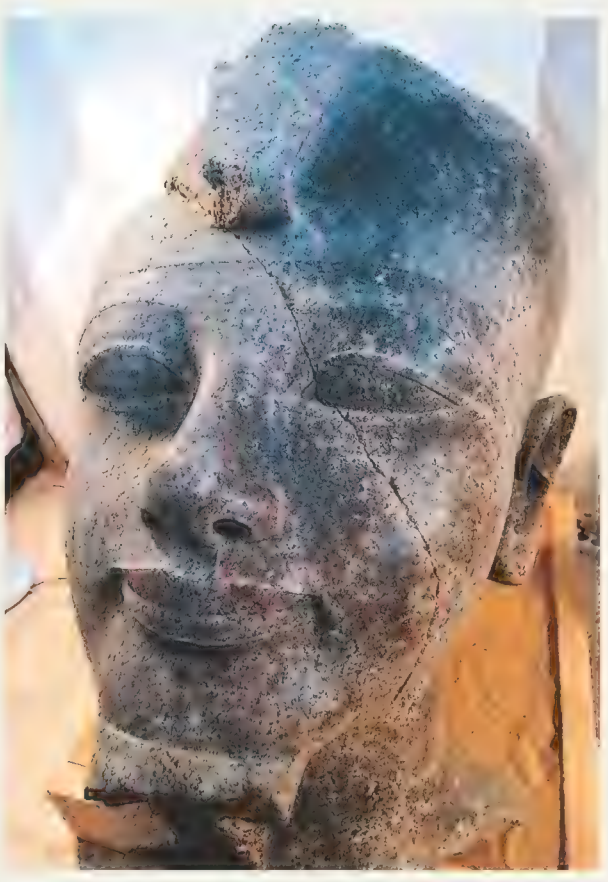
Amenhotep III was succeeded by one of the first known monotheists

Not long after Amenhotep III died, in 1353 B.C., masons entered his mortuary temple and methodically chiseled out every mention of Amun, the god said to have fathered the great pharaoh. Astonishingly, the order to commit this blasphemy came from the king's own son. Crowned Amenhotep IV, he changed his name to Akhenaten in his fifth year on the throne and focused his energies on promoting a single god, Aten, the sun disk. Together with his beautiful queen Nefertiti, he built a new capital, Akhetaten (today known as Amarna), banned representations of several deities and set about destroying all inscriptions and images of Amun, from the Nile Delta to today's Sudan.

Akhenaten's attempt to suppress one god and advance another in a culture that reveled in a complex pantheon of ever-changing deities did not endure. Yet no other pharaoh—save perhaps his son, the boy king Tutankhamen, who quickly reversed his father's campaign—has so captured the modern imagination. Agatha Christie wrote a play and Philip Glass composed an opera named after Akhenaten, and Nobel Prize winner Naguib Mahfouz penned the novel *Dweller in Truth* about the heretic king who dared to overturn a religious system that was older than Islam is today. The ancient Egyptian set of beliefs, with its focus on death and the afterlife and with deities who can change their species, remains alien and mysterious to most Westerners.

Early Egyptologists saw in Akhenaten's approach the first stirring of the great monotheisms of Judaism, Christianity and Islam to come. "Not a rag of superstition or of falsity can be found clinging to this new worship," wrote Flinders Petrie, a British archaeologist who dug at Akhenaten's capital in the early 1890s. Sigmund Freud even argued that Moses was an Egyptian priest who spread the religion of Aten. There is, of course, no evidence linking the cult of Aten to today's monotheisic beliefs, and no archaeological evidence of Hebrew tribes appears until two centuries after the pharaoh's death. Nor do scholars agree on what accounted for Akhenaten's beliefs. "As a result," says Egyptologist Betsy Bryan at Johns Hopkins University, "people tend to allow their fantasies to run wild."

But Akhenaten's faith can at least be traced to the time of Amenhotep III, who named a royal boat as well as a Theban palace after Aten. (The name "aten" had simply been a word meaning "sun" until Amenhotep III's father elevated Aten to the status of a deity.) Amenhotep III's primary devotion, however, was to Amun-Ra, a combination of Thebes' deity Amun and the northern Egyptian sun god Ra. According to an inscription describing the pharaoh's conception, Amun disguised himself as Thutmose IV and entered the queen's bedchamber. The god's alluring aroma woke her, "and then the majesty of this god did all that he desired with her." By claiming Amun as his father, Amenhotep III "tried to show himself as close to a god as any pharaoh before him," says Bryan.



Amenhotep III (a granite head from the temple complex is his best extant portrait) was succeeded by his son Akhenaten, who revolutionized Egypt's religion—temporarily.

While Amenhotep III accepted the traditional view that all gods are aspects of the same divine essence, there are hints that a theological split was already in the offing. Bryan notes that some inscriptions from the pharaoh's mortuary temple mention only Aten.

Other Egyptologists point out that Akhenaten tolerated other gods and seems to have had it in just for Amun. Some believe that in erasing Amun, Akhenaten may have wanted to bring more order to a confusing pantheon. Others think he was battling the political power of a wealthy priesthood. And then there are more psychoanalytic interpretations—that he either worshiped his father as Aten or rebelled against his father's devotion to Amun. Ray Johnson of the University of Chicago sees a link between the sculptures and friezes of Amenhotep III's reign and the naturalistic art of Akhenaten's time, and he and others suggest that father and son shared the throne for some years before the father's death at around age 50. "We don't get motivations" in the surviving texts, says John Baines of Oxford University. "It's very unwise to think we know enough to be sure."

Still, Akhenaten's eradication of Amun's name and images throughout Egypt "has all the signs of a true extremist," says Bryan. In any case, his vision didn't survive him. After Akhenaten's death, masons again entered Amenhotep III's mortuary temple. They recarved Amun's name, and while they were at it, they erased all mention of Akhenaten. ***—A.L.***

death that toppled its columns and walls, successive pharaohs raided it for their own temples. Ramses II took two seated colossi in the 13th century B.C., and the site was still being scavenged a thousand years later. The earthquake in 27 B.C. toppled much of what remained. Nineteenth-century treasure hunters carted off what they could find from the rubble—sphinxes to embellish the Neva River embankment in St. Petersburg, royal statues to London's British Museum and a head of the pharaoh to the Louvre in Paris. Excavations from the 1950s through the 1970s revealed little more than scattered stone fragments and artifacts.

Today's most insidious threat is the slow rising of groundwater. In the past, the Nile flooded annually, replenishing fields along the river before retreating to within its banks. (Some scholars, though not Sourouzian, believe Amenhotep III's temple was designed to allow the holy Nile floodwaters to wash through the gates and plazas.)

After eight years of digging, archaeologists are just beginning to understand Amenhotep III's temple. About 5,000 artifacts have been cataloged so far.

Since the Aswan High Dam was completed in 1970, the Nile waters no longer surge over its banks (and the river is two miles from the temple site), but sugar cane farmers irrigate year-round, turning the desert into soggy soil. The water carries salts that eat away at stone, particularly more porous varieties such as limestone and sandstone.

ON A SPRING MORNING, the huge field, bordered by sugar cane and the road to the Valley of the Kings, resembles a busy construction site. At the spot where a pylon once stood behind the Colossi of Memnon, researchers sit under tarps, patiently sorting and photographing fragments from one of two smaller colossi that fell in antiquity. The head of one of them alone weighs 25 tons, and nearly 200 workers and a winch were required to pull the broken statue out of the mud. Sourouzian hopes to re-erect those statues—each torso weighs 450 tons—once the ground dries and a secure foundation can be built.

Nearby, an alabaster statue of a crocodile and two more statues of Amenhotep III, also in alabaster, wait to be cleaned. Remains of massive sandstone columns are in rows of three and four. The columns formed the edges of the great peristyle hall, or sun court, and once stood on crude blocks and gravel. "Obviously, they were cutting corners here and there," says Theodore Gayer-Anderson, a British archaeologist on the team. "They weren't the ideal builders." The stubs of the columns are fragile, and to coax out salt, which is corrosive, Gayer-Anderson coats them in a poultice of deionized water, cellulose powder and mineral powder. Each wrapping must be changed every two days. "It's impossible to eliminate the salt," he says. "But you can cleanse the skin to a stable level."

A few yards away, a seven-ton torso of Amenhotep III dangles below an iron tepee, as workers prepare to marry it to a base covered in protective scaffolding. The statue's head was found a century ago and is now in the British Museum. The museum has promised to send a cast of the head to be placed on the torso next spring. An Egyptian foreman barks at the workers as the torso is raised into place, while a Spanish archaeologist paces across some beams. "I'm not nervous—that wouldn't help," he announces.

This is the first of five 25-foot-high statues of Amenhotep III that the team intends to re-erect. The statues once stood between the columns. On the north side of the peristyle hall, the statues are made from quartzite from near today's Cairo and they wear the chair-shaped crown of lower Egypt (that is, northern Egypt, which lies downstream along the Nile). On the south side, the images are made from Aswan's red granite and wear the white conical headpiece of upper Egypt. In addition to the statues of the pharaoh, which were in fragments, an alabaster hippopotamus surfaced, minus head and tail, along with six standing statues of Sekhmet, beautifully preserved, each holding a papyrus bundle in one hand and an ankh—the symbol of life—in the other.

The excavation is only in its initial phases and could take two decades or more. To the west of the peristyle hall was a hypostyle hall, a vast interior space that once had a roof supported by massive columns. It no doubt holds more statues and artifacts. "You would need years and millions of dollars to excavate," says Sourouzian, looking with a touch of longing over the bare ground. "What's more urgent is to save the statues, preserve the last remains of the temple and present it with dignity."

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COMMAND PERFORMANCE

With U.S. forces in Korea beleaguered and demoralized in 1950, American prestige and the future of South Korea hung in the balance. Then Gen. Matthew B. Ridgway took charge

BY DAVID HALBERSTAM

In August 1945, at the end of World War II, Russia and the United States divided the Korean peninsula at the 38th parallel into communist north and western-aligned south, setting the stage for one of the first great conflicts of the Cold War. After North Korea invaded the south on June 25, 1950, U.N. forces, led by the United States, entered the war on South Korea's behalf. General Douglas MacArthur's daring landing at Inchon on September 15, 1950, pushed the North Koreans almost to the Yalu River on the Chinese border. MacArthur, however, had made a disastrous miscalculation—that the Chinese would not enter the war. In November 1950, 300,000 Chinese routed U.N. troops, forcing a retreat. It was at this dark hour, following the death of Lt. Gen. Walton Walker in a jeep accident, that Lt. Gen. Matthew B. Ridgway was ordered to Korea.

IF EVER AN AMERICAN OFFICER was perfectly suited for a particular moment in American military history, it was Matthew Bunker Ridgway when he was summoned to take over the shambles of a dysfunctional Eighth Army. He was the flintiest of men, rather humorless, fiercely aggressive, as unsparing of himself as he was of others. The G.I.'s admired him, even if they did not love him. They knew that he did not play games, that he had a genuine feel for them and their hardships, and that he would be on their side if they had legitimate grievances.

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From the day he arrived in Korea, Ridgway (grenade on shoulder, above) boosted morale. A Corps chief of staff would recall: "He'd go out all day with the troops, then when he came back at night, I'd have to brief him again—on *everything*."

One could not think of him except as a soldier—and not a peacetime soldier either. Though he had none of the grandiosity of MacArthur, he had his own mystique and his own very personal sense of his role in history. He believed that he and the men he commanded were the direct descendants of those who had gone before them, dating back to Valley Forge. It was as if George Washington and the men who fought with him were always looking over his shoulder. Ridgway sometimes talked in an almost mystical way of those who had fought in the Revolution or the Civil War, and of the need for his men to be worthy of the hardships they had suffered.

Though he was fiercely anti-Communist, he was not, like MacArthur, on an ideological crusade. The enemy was the enemy, to be analyzed on the basis of actual strengths and weaknesses. If ideology made the Chinese or North Koreans better, more committed soldiers, then attention should be paid to that fact.

Ridgway was in his own way a very serious hawk, but unlike MacArthur, he accepted that this was a limited war, that the civilians running it had pressures on them that officers in the field might not grasp and that the main battlefield might end up thousands of miles from Korea, most likely in Central Europe where the Soviets had placed so many armored divisions.

In World War II, Ridgway (left, with Britain's Gen. Montgomery, right, c. 1944) led the 18th Airborne Corps. Recalled his deputy: "It seemed as if it was . . . Ridgway versus the Wehrmacht."

He was an imposing man, forceful and trim, 5-foot-10 but thanks to the sheer force of his personality, seemingly much bigger. He was a Spartan. He worried that America was in decline because of the country's ever greater materialism; he warned that it was becoming a place where people never walked anymore and that the nation's men were becoming softer every year. His views, ironically, were not all that different from those of the Chinese commanders who had launched their successful assault on American troops. He believed a loss of fiber had contributed to the disappointing early performance of our young men in Korea. They had become too dependent on their machines and their technology. The first thing he intended to do when he took over was get them out of the warmth of their jeeps and trucks and make them patrol exactly as their predecessors had done, climbing the hills on foot. If they shared nothing else with their enemy, they would share the cold.

Ridgway bristled with personal purpose: he had an innate sense of how to lead, of what motivated fighting men—and what did not. There were at least three moments in his career when his country had reason to think of him as someone who, by dint of intelligence and character, set himself apart from his peers. The first was when he led the airborne assault on France on D-Day in June 1944. The second was in 1954, after elite French forces had been trapped by the Vietminh at Dien Bien Phu and pressures grew on the Americans to come to their aid. At that time, as Army chief of staff, he wrote a memo so forceful in assessing the extremely high cost of an American entry into the war in French Indochina (and the potential lack of popularity of such a war) that President Dwight Eisenhower put aside any idea of intervention. And the third was when he took over the shattered Eighth Army, in late December 1950, and in two short months reinvigorated it, thereby blunting a Chinese offensive that threatened to drive U.N. forces into the sea or push the Americans into using atomic weapons.

THERE WAS A CONstancy to his code of honor. He had been assigned to command the Eighteenth Airborne Corps in the final battle for Japan, but then the war had ended quickly. MacArthur had invited him to attend the surrender on the battleship *Missouri*, a great honor, but he declined—only the men who fought in the Pacific, he believed, should attend. Still, there was no false modesty to him—he knew he was good and that was not by happenstance. Bill Sebald, the American ambassador to Japan, wrote a draft speech that Ridgway was to give on his arrival in Tokyo at the moment in 1951 when he finally replaced MacArthur as the commander of all American forces in the Far East and de facto governor-general of Japan. In it, Sebald had him saying "with due humility." Ridgway edited the phrase out. "Bill, I'm humble only before my own God, not before the Japanese people or anyone else."

He was not caught up in the vainglory of war. He never tried to sugarcoat what war was about. When he nicknamed his first major Korean offensive Operation Killer, he received a note from Army chief of staff Joe Collins, suggesting that such a name might be difficult for the Army's public relations people to deal with. Ridgway was not moved by the objections of PR people on this or any other issue. The name, he had been told, was too bloodthirsty and lacked sex appeal. Later he wrote, "I did not understand why it was objectionable to acknowledge that war was concerned with

DAVID HALBERSTAM *died in an automobile accident on his way to interview former quarterback Y. A. Tittle last April.*

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"ALL LIVES ON A BATTLEFIELD ARE EQUAL," RIDGWAY ONCE SAID, "AND A DEAD RIFLEMAN IS AS GREAT A LOSS IN THE EYES OF GOD AS A DEAD GENERAL."

killing the enemy. . . . I am by nature opposed to any effort to 'sell' war to people as an only mildly unpleasant business that requires very little in the way of blood."

He was aware that he was in charge of the most precious kind of national resource—the lives of young men who were dear to their parents. "All lives on a battlefield are equal," he once said, "and a dead rifleman is as great a loss in the eyes of God as a dead General. The dignity which attaches to the individual is the basis of Western Civilization, and this fact should be remembered by every Commander." That did not mean he did not fight the enemy with full ferocity or take a certain pleasure from a battlefield littered with their dead, for he knew the alternative, a battlefield littered with American dead. After the Battle of Chipyongni in February 1951, when the Chinese finally broke and the Americans killed thousands with air and artillery strikes, one company commander had spoken of the battlefield as covered with "fricasseed Chinese." Ridgway liked that phrase.

Ridgway (in back seat, facing camera, Korea, 1951) wrote of his superior, Douglas MacArthur (riding shotgun), that he "had been completely misguided in his attempts to read enemy intentions."

There was a vast unacknowledged difference in his and MacArthur's concepts of leadership, produced not merely by greatly different temperaments, but by different visions of leadership in very different eras. So much of MacArthur's own energy went into building the commander up as a great man—as if, for the men in the ranks, fighting under so great a general would in itself make them great as well. Ridgway's concept of leadership was better suited for a more egalitarian era. He intended to impose his will on his men, but to allow the men under him to find something within themselves that would make them more confident, more purposeful fighting men. It was, then, their confidence in themselves that would make them fight well, he believed, not so much their belief in him. His job was to teach them to find that quality in themselves. Like MacArthur, however, he knew the importance of myth and was skilled at creating his own. "Old Iron Tits" was his nickname, based on the belief that it was two grenades he had pinned to the harness on his chest—one was a grenade, the other a medical kit. But the message was clear—Matt Ridgway was always ready to fight.

Ridgway arrived in Korea on December 26, 1950. The first thing he remembered was the cold—"It stuck to the bone," he noted. He had already flown to Tokyo and met with MacArthur, who told him, "The Eighth Army is yours, Matt. Do what you think best." That statement of itself signaled the end of one phase of the Korean War—in the past, everything had been run out of Tokyo. Now the command was his. The question was: Could he keep his troops from being driven off the peninsula? Because Korea was such a grinding war, with such an unsatisfactory outcome, not many military men emerged from it as heroes. Grim wars that end in stalemates may produce men who are heroes to other soldiers, but not to the public at large. Thus Ridgway was revered in years to come not so much by ordinary Americans, who had largely turned away from the war, but by the men who fought there and knew what he had done. In Korea he was the soldier's soldier. Gen. Omar Bradley, a plain-spoken Midwesterner not readily given to superlatives, wrote years later of Ridgway's performance in Korea, "It is not often in wartime that a single battlefield commander can make a decisive difference. But in Korea, Ridgway would prove to be the exception. His brilliant, driving, uncompromising leadership would turn the battle like no other general's in our military history."

On arrival Ridgway almost immediately started to tour forward positions. He was appalled by what he found: defeatist attitudes on the part of his commanders, low morale and almost no military intelligence of any significance. He visited one corps commander who did not even know the name of a nearby river. "My God almighty!" he said later of that particular piece of ignorance. How could there be decent intelligence when all the American units had broken off contact with the enemy and were fleeing south? "What I told the field commanders in essence," he later wrote, "was that their infantry ancestors would roll over in their graves could they see how road-bound this army was, how often it forgot to seize the high ground along its route, how it failed to seek and maintain contact in its front, how little it knew of the terrain, and how [it] seldom took advantage of it." He was sickened by finding an army broken in spirit, "not in retreat, but in flight," as

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Lt. Col. Harold Johnson, who had been at Unsan, said. Ridgway thought the corps commanders shockingly weak, the division and regimental commanders too old and more often than not out of touch as well as ill-prepared for this war. Nothing enraged him more than the maps at the various headquarters he visited. Each American unit, it seemed, was surrounded by little red flags, each flag indicating a Chinese division. But many of his units simply had no idea how many Chinese were near them because they were not sending out patrols. Not to know the location and strength of the enemy was in his eyes as great a sin as a commander could commit. He changed that quickly. He was everywhere in those days. He visited each headquarters, not just division and regimental, but sometimes battalion and company, arriving in his little plane flown by pilot Mike Lynch, landing where he had no business showing up and often where no airstrip existed. What he wanted was for the most forward units to go out and find the enemy. They were to patrol, patrol, patrol: "Nothing but your love of comfort binds you to the roads," he kept repeating. "Find the enemy and fix him in position. Find them! Fix them! Fight them! Finish them!"

Ridgway (with his wife, Penny and son, Matthew Jr., 4, 1953) gave credit to his spouse for his meteoric rise: "Her common sense, tact and thoughtfulness for others won over everyone."

Very quickly he promulgated a new Ridgway rule of mapping. He would look at the local map with a red flag or two on it and ask when the last time was that the unit had had contact with the Chinese. At first the usual answer was four or five days—for most American units were in fact staying as far away from the Chinese as possible. With a gesture of complete contempt, he would then reach out and take the flags off the map. The new rule was that a red flag could stay on a map only if the unit had made contact in the previous 48 hours. The unstated corollary of this rule was equally simple: if the commander of the Eighth Army, a known and feared hard-ass, returned and found the situation unchanged, it would quite likely not just be the little red flag that would disappear but the unit commander as well.

WITH RIDGWAY'S arrival, MacArthur, his forces defeated by the Chinese along the Chongchon and Yalu rivers, had not only lost his great gamble but in effect his command as well. The two men spent an hour and a half together in Tokyo on December 26, 1950, much of the time taken up by a monologue delivered by MacArthur. It was quickly clear what the commander in the Far East wanted. "There isn't any question that MacArthur wanted to go to war," Ridgway would say later, "full war with Communist China. And he could not be convinced by all the contrary arguments. . . . He reluctantly acted in accordance with the policy, but he never did accept it."

Ridgway knew the limits of the hand he had been dealt. Washington wanted to bring the Chinese to the negotiating table without investing significantly more resources in Korea. That, Ridgway knew, would be his job, and it would be a bloody one—to make the Chinese pay so high a price that victory would seem as out of reach to them as it already seemed to Washington.

If there was going to be an unspoken limit on the number of divisions allotted him, then he would compensate with far greater firepower, especially more artillery—which was why he so quickly pressed for more artillery units. He was shocked—given the enormous potential advantage that artillery offered and the limits that the Chinese and North Korean styles of warfare placed on them—that the Americans had not emphasized their advantage in big guns earlier. Now he asked for ten more National Guard and Reserve artillery battalions. The use of artillery as a key factor in the kind of grinding war he was already envisioning was obvious. After all, the United States was rich with weaponry and ammunition but wanted to conserve its manpower; and the Chinese were desperately limited in their ability to bring heavy guns, which, in any case, would be vulnerable to U.S. air power, to the battlefield. Ridgway intended to even out the demographics in the crudest, cruelest way possible—with long-range guns. The new artillery units were ordered in country as quickly as possible.

From the start Ridgway believed the war could be fought as what he called a meat grinder. On January 11, just two weeks after he had arrived in country, he had written his friend Ham Haislip, the Army's vice chief of staff, "the power is here. The strength and the means we have—short perhaps of Soviet military intervention. My one overriding problem, dominating all others, is to achieve the spiritual awakening of the latent capabilities of this command. If God permits me to do that, we shall achieve more, far more than our people think possible—and perhaps inflict a bloody defeat on the Chinese which even China will long

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"NOTHING BUT YOUR LOVE OF COMFORT BINDS YOU TO THE ROADS," HE KEPT REPEATING. "FIND THE ENEMY. . . . FIND THEM! FIX THEM! FIGHT THEM! FINISH THEM!"

remember, wanton as she is with the sacrifice of lives."

His confidence was contagious—and those who did not share it would soon find themselves at other jobs. He was changing the Eighth Army as quickly as he could into an effective fighting force. He understood something that few others realized at the time: the physical damage to the Eighth Army was less than everyone imagined; the real damage had been psychological or emotional. Some divisions had lost a great deal of equipment yes, but that could be replaced. The surprise that had resulted from stumbling into a giant Chinese trap at the Chongchon and Yalu rivers and fighting a brand-new enemy in such poorly chosen terrain had magnified the sense of damage and the resulting defeat had crushed his army's morale. That was what had to be rebuilt—the spiritual or psychological side of his force.

Testifying before Congress as NATO commander in 1953, Ridgway warned that the Soviets' ground forces constituted "a continuing blackmail threat to Europe and the Free World."

Ridgway was unintimidated by those early Chinese victories and the awesome size of the Chinese force; he seemed to have his finger on the strength and weakness of every unit and was full of confidence about what his forces could do. That was the way he had commanded in World War II. He was, his talented World War II deputy Jim Gavin once said, always drawn to the cutting edge of battle. "He was right up there every minute. Hard as flint and full of intensity, almost grinding his teeth with intensity; so much so that I thought that man's going to have a heart attack before it's over. Sometimes it seemed as though it was a personal thing: Ridgway versus the Wehrmacht. He'd stand in the middle of the road and urinate. I'd say: 'Matt, get the hell out of there. You'll get shot.' No! He was defiant. Even with his penis he was defiant."

In contrast to MacArthur, who never spent a night in Korea and who saw the war primarily in theoretical terms, Ridgway was there all the time. He wanted the fighting men in the field to know that he shared their knowledge and their hardships, and he wanted field commanders to know that he could not be fooled. His presence put everyone to a constant test of excellence. The Corps chief of staff later said of that period, "Oh God! He came to *every* briefing *every* morning. . . . He'd go out all day with the troops, then when he came back at night, I'd have to brief him again—on *everything*, even minor things like which way the water drained in our sector." Soon three division commanders were on their way home. They would be praised for what they had done, given medals and honorable new jobs, but the Eighth Army was not going to retreat any more.

The other thing they were going to do was know their enemy—one more sign that the days of grandiose contempt for an Asian enemy, so racist in origins, were over. More than most senior American commanders of his era, Matt Ridgway had a passion for intelligence. The American Army had always taken its intelligence functions somewhat casually; the men assigned to intelligence duty tended to have been passed over in their careers, not quite good enough for the prized command positions. Perhaps it was the nature of the modern American Army—it had so much force and materiel that when it finally joined battle, intelligence tended to be treated as secondary, on the assumption that any enemy could simply be outmuscled and ground down.

There were a number of reasons for Ridgway's obsession with intelligence. Some of it was his own superior intellectual abilities; he was simply smarter than most great commanders. Some of it was his innate conservatism, his belief that the better your intelligence, the fewer of your own men's lives you were likely to sacrifice. A great deal of it was his training in the airborne, where you made dangerous drops behind enemy lines with limited firepower and were almost always outnumbered and vulnerable to larger enemy forces.

The CIA, blocked from the Korean theater by MacArthur and Brig. Gen. Charles Willoughby, was soon welcomed back; there was going to be a healthy new respect for the enemy. The Chinese had identifiable characteristics on the battlefield. They also had good, tough soldiers. Some units were clearly better than others, some division commanders better than others and it was vital to know which these were and where they were. Now he intended to study them. There would be no more windy talk about the Oriental mind. The questions would be: How many miles could they move on a given night? How fixed are their orders once a battle begins? How much ammo and

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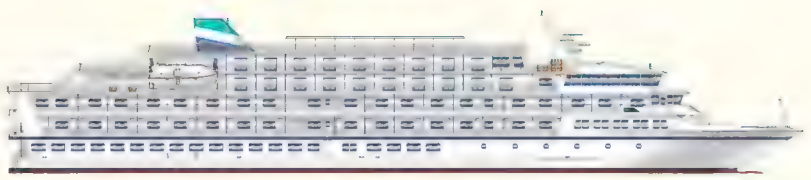

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food do they carry into each battle—that is, how long can they sustain a given battle? The essential question was: How *exactly* can we tilt the battlefield to our advantage?

Ridgway now intended to play at least as big a role in the selection of the battlefield as his Chinese opposites. For a time, he started his day by getting in a small plane and, with Lynch at the controls, flying as low as they could, looking for the enemy. With that many Chinese coming at his army, there had to be signs of them, evidence that they existed, but he saw almost nothing. That he found nothing did not create a lack of respect for them—rather it brought greater respect for the way they could move around, seemingly invisible. Gradually he began to put together a portrait of who they were and how they fought—and so, how he intended to fight them. The Chinese were good, no doubt about that. But they were not supermen, just ordinary human beings from a very poor country with limited resources. Not only did the Chinese operate from a large technological disadvantage, they had significant logistical and communications weaknesses. The bugles and flutes announcing their attacks could be terrifying in the middle of the night, but the truth was that they could not react quickly to sudden changes on the battlefield. Certain logistical limitations were built into any attack they made—the ammunition and food they could carry was finite. The American Army could resupply in a way inconceivable to the Chinese and so could sustain a given battle far longer.

In 1985, Ridgway, then age 90, accompanied President Reagan to a widely protested reconciliation ceremony at Bitburg, Germany, to honor German and Allied war dead buried there.

Ridgway spent his first few weeks in country pressing everyone for information about the Chinese fighting machine. By the middle of January, he felt he knew what he needed to know. This war, he decided, was no longer going to be primarily about gaining terrain as an end in itself, but about selecting the most advantageous positions, making a stand and bleeding enemy forces, inflicting maximum casualties on them. At a certain point, even a country with a demographic pool like China's had to feel the pain from the loss of good troops. He wanted to speed up that moment.

The first thing he realized was that it was a disaster to retreat once the Chinese hit. The key to their offensive philosophy was to stab at a unit, create panic, and then, from advantageous positions already set up in its rear, maul it when it retreated. All armies are vulnerable in retreat, but an American unit, because of all its hardware, condemned to the narrow bending Korean roads, was exceptionally so. Ridgway's long training as an airborne man was critical to the strategy he sought now. He meant to create strong islands of his own, sustain unit integrity with great fields of fire and then let the enemy attack.

What Ridgway wanted to do was start the Eighth Army moving north again—for reasons of morale as much as anything. In mid-January, he began the process, sending Col. Mike Michaelis' 27th Regiment Wolfhounds toward Suwon. He named this first offensive action Operation Wolfhound in their honor. Michaelis had known Ridgway before Korea, but not well. Still, he had been struck by Ridgway's fierce beetle-eyed glare—that was how he would later describe it—that went right through you. Ridgway had been in Korea only a few days when he called Michaelis in.

"Michaelis, what are tanks for?" he asked.

"To kill, sir."

"Take your tanks to Suwon," Ridgway said.

"Fine sir," Michaelis answered. "It's easy to get them there. Getting them back is going to be more difficult because they [the Chinese] always cut the road behind you."

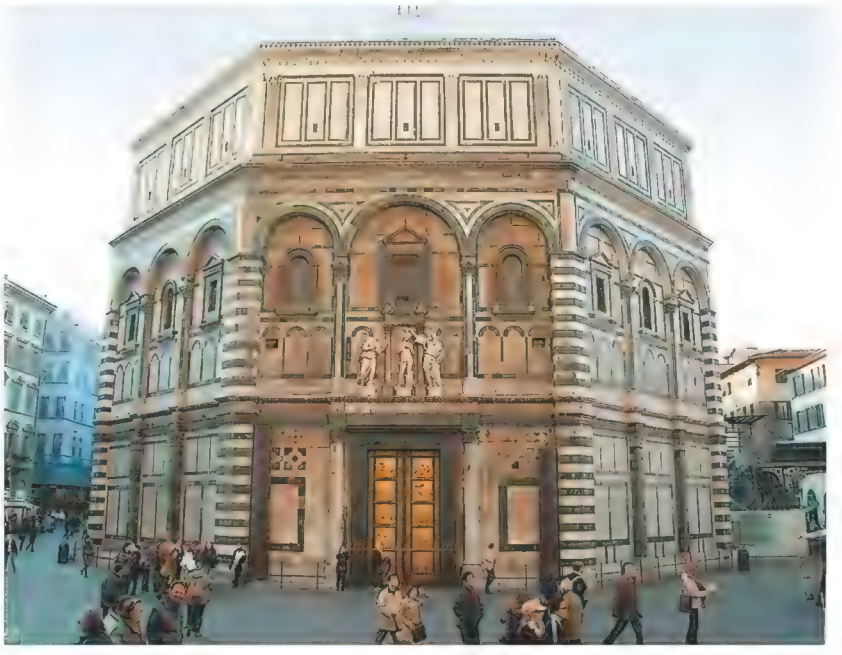
"Who said anything about coming back?" Ridgway answered. "If you can stay up there 24 hours, I'll send the division up. If the division can stay up there 24 hours, I'll send the corps up." That, thought Michaelis, was the start of a brand-new phase of the war, the beginning of the turnaround. Without the Chinese leadership realizing it, a very different American and U.N. Army were coming together in Korea.

By March 1951, Ridgway's leadership and tactical brilliance had turned near-certain defeat of U.N. forces into stalemate. On April 11, 1951, President Truman removed MacArthur from command; Ridgway succeeded him as Allied Commander of the Far East. A cease-fire was declared on July 27, 1953. The peninsula remained divided at the 38th parallel.

U.S. casualties numbered 33,000 dead and 105,000 wounded. The South Koreans suffered 415,000 killed and 429,000 wounded. The Chinese and North Koreans maintained secrecy about their casualties: estimates are 1.5 million dead. A state of tension endures between the two Koreas, poised on either side of a 2.5-mile wide demilitarized zone. The United States maintains a force of some 28,000, including soldiers and marines, in South Korea.

REUTERS / LANDOV

The GATES *of* PARADISE



Restored to their Renaissance glory, panels from the gilded doors sculpted by the Florentine master Lorenzo Ghiberti tour the United States for the first time

BY ARTHUR LUBOW

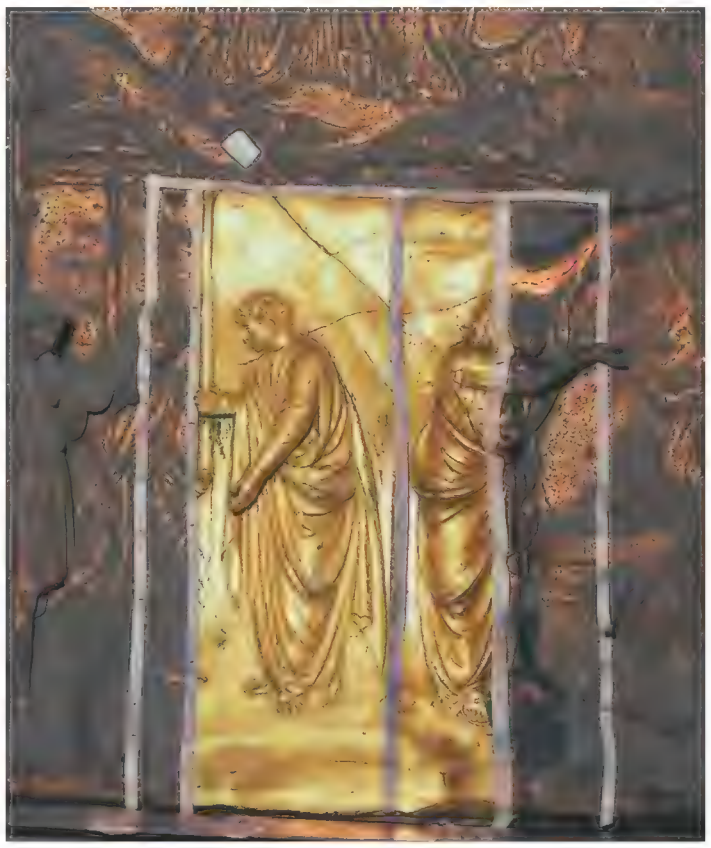
"I strove to imitate nature as clearly as I could, and with all the perspective I could produce," wrote sculptor Lorenzo Ghiberti of the gilded bronze doors he created for Florence's Baptistery. (Replicas cast from the originals are now in place.) "I carried out this work with the greatest diligence and the greatest love."

MICHELANGELO LIKENED THE GILDED BRONZE DOORS of Florence's Baptistery of San Giovanni to the "Gates of Paradise." The phrase stuck, for reasons that anyone who has seen them will understand. Combining a goldsmith's delicacy with a foundryman's bravura, sculptor Lorenzo Ghiberti condensed the Old Testament into ten panels to produce one of the defining masterpieces of the Italian Renaissance. Since their installation in 1452, the doors have withstood a variety of near-biblical catastrophes: a torrential flood, vandalism, overzealous polishing and caustic air pollution. When the doors were finally removed for restoration from the facade of the 11th-century octagonal Baptistery in 1990, they looked dull and grimy.

But the worst damage was occurring almost invisibly. Diagnostic studies revealed that fluctuations in humidity were causing unstable oxides on the bronze beneath the gilding to dissolve and recrystallize, creating minute craters and blisters on the gold surface.

A disastrous Arno River flood in 1966 had knocked five panels off the door frames and left another hanging loose. (A conservator later drilled holes in the panel backs to reattach them with screws.) The restorers' first task was to clean the six panels, successively bathing them in a Rochelle salt solution and water, then applying acetone and drying them with warm air. "It was a great surprise when we took the first panel out and saw how much gold was there and how shiny it was," says Stefania Agnoletti, the conservator in charge of the cleaning. "It was an emotional moment."

After laboriously removing the four additional panels and some of the other firmly embedded gilded elements, the conservators decided it was too risky to continue. To clean the gilded elements still attached, the team adapted laser techniques that they had used successfully to clean stone statues. The drawback of lasers is their tendency to heat surfaces, which would harm the gilding. But scientists in Florence developed one that could beam a more intense ray for a shorter time, and in 2000, the conservators began using it on the doors' gilded sculptures. For ungilded portions, they employed an array of tools that resemble a dentist's arsenal: a small scalpel for thick encrustations, a drill for precise excisions and a little rotating brush for polishing. They hope to finish the work in 2008.



To celebrate the nearly completed restoration, three of the ten panels (and four of the doors' smaller sculptural pieces) are now touring the United States as part of an exhibition organized by the High Museum of Art in Atlanta. The show, which opened there and traveled to the Art Institute of Chicago, will go on to the Metropolitan Museum of Art in New York (Oct. 30-Jan. 14, 2008) and end at the Seattle Art Museum (Jan. 26-April 6, 2008). Then the sculptures will return to Florence to be reattached to the door frames and encased in a plate-glass box, into which inert nitrogen will be pumped to prevent future oxidation. The restored doors will be displayed in the city's Museo dell'Opera di Santa Maria del Fiore. A shiny replica, installed in 1990, will remain at the Baptistery itself.

Ghiberti's doors were instantly recognized as a masterpiece. As one commentator declared in the 1470s, "nothing like them had been done before on the globe and through them the name of man shines everywhere." The three panels selected for the U.S. tour—"Adam and Eve," "Jacob and Esau" and "David"—show why. By combining several biblical episodes into a single frame in "Adam and Eve," Ghiberti demonstrated his com-

Writing a century after their installation, artist and biographer Giorgio Vasari judged the doors to be "perfect in every detail." The ten 31 1/2-inch-square panels have now been restored. (Top, a conservator uses a laser to clean a relief embedded in the door frame; bottom, a partially cleaned section). Three panels (opposite: clockwise from top: "Adam and Eve," "Jacob and Esau" and "David") are touring the United States.

ARTHUR LUBOW *lives in Manhattan and writes frequently on the arts. His article on American artists in Paris ran in January.*

OPIFICIO DELLE PIETRE DURE, FLORENCE; ANNAMARIA GIUSTI / OPIFICIO DELLE PIETRE DURE, FLORENCE; PP. 68-69 CHRIS PARKER / AXIOM; P. 69 HIGH MUSEUM OF ART, ATLANTA

OPIFICIO DELLE PIETRE DURE, FLORENCE (3)

mand of high and low relief and introduced a narrative technique new in sculpture—the simultaneous depiction of successive scenes. And with his portrayal in "David" of a pitched battle and a triumphal procession, the artist showed a flair for evoking large crowds within a small area.

The third panel, "Jacob and Esau," is Ghiberti's most masterful. "It best demonstrates his genius," says Syracuse University professor Gary Radke, the curator of the exhibition, because "it shows so many aspects of Renaissance art." The receding tiles of the floor illustrate the recent innovation of scientific perspective, and the arches and pilasters are inspired by Roman architecture as interpreted in Filippo Brunelleschi's spare, monumental churches. (Brunelleschi is renowned as the architect of the dome of Florence's Cathedral of Santa Maria del Fiore, known more familiarly as the Duomo.) Ghiberti also played here with sculptural illusion by extending some of his figures almost off the panel, while depicting others in low relief. The artist apparently shared posterity's high regard for this achievement. "Ghiberti put his own self-portrait and his signature right under it," Radke notes. The self-portrait bust shows a bald man of about 60, with a shrewd gaze and a thin, broad mouth that seems to be smiling with self-satisfaction.

PERHAPS BECAUSE Ghiberti was no radical, his standing has long been subordinated to those of his contemporaries—especially Brunelleschi and the sculptor Donatello—who appeared to depart more dramatically from medieval traditions. But the view of Ghiberti as a conservative is a misconception; though he retained an allegiance to the restraint and balance of medieval art, he innovatively used physical movements and individual features to reveal mood and character. "He's got both feet in both worlds," says Radke. "You can see him develop new ways to be more expressive and illusionistic, and to include bigger crowds and lots more effects, but he doesn't do it in a wildly revolutionary way. He has a real talent for presenting novelty so that it seems to come out of the recent past."

Ghiberti apprenticed in childhood to goldsmith Bartolo di Michele, who was his stepfather or, possibly, his father. His mother, Mona Fiore, the daughter of a farm laborer, had made what seemed an advantageous marriage in 1370 to Cione Ghiberti, the son of a notary, but, after a few years, left him for Bartolo, with whom she lived in a common-law marriage. (After Cione's death in 1406, they wed.) The facts of Lorenzo's paternity remain in dispute, but in any case the young man was raised as a goldsmith's son and showed a precocious aptitude for the craft.

In 1401, Bartolo informed Ghiberti, who had left Florence during a brief outbreak of the plague, that the Baptistery in Florence was commissioning a second set of bronze doors. The first set, produced by Andrea Pisano 70 years before, was a widely recognized triumph of bronze casting; the new commission would be the most important in Florence since Pisano's. According to Giorgio Vasari's 16th-century *Lives of the Artists*, Bartolo advised Ghiberti that "this was an opportunity to make himself known and to show his skill, besides the fact that he would make such a profit from it that neither would ever again have to work on pear-shaped earrings."

The competition was organized by the Calimala, a guild of wealthy wool-cloth merchants who supervised the decoration of the Baptistery. Seven finalists, including Ghiberti, worked for a year to depict in bronze the story of Abraham's call to sacrifice his son Isaac. In the end, it came down to two artists, Ghiberti and Brunelleschi. As can be seen in their rival entries (opposite), Brunelleschi's version emphasizes the violence, while Ghiberti devised a calmer, more lyrical composition.

To our eyes, the Brunelleschi seems more powerful and "modern." But Brunelleschi's determination to cram as many attention-grabbing devices into one work may have seemed willful to 15th-century Florentine jurors. Certainly, Ghiberti's craftmanship was superior; unlike Brunelleschi, who soldered his panel from many separate pieces of bronze, Ghiberti cast his in just two, and he used only two-thirds as much metal—a not-inconsiderable savings.

The combination of craft and parsimony would have appealed to the practical-minded men of the Calimala. By his own account, Ghiberti won the competition outright; but Brunelleschi's first biographer says that the jury asked the two men to collaborate and Brunelleschi refused. In any event, in cooperation with Bartolo (Ghiberti, only about 20, was still too young to be a member of a trade guild and required a co-signer) and a distinguished studio of assistants that included Donatello, Ghiberti took on the job. It would occupy him for the next two decades.

During those years, Ghiberti also found time to start a family. He married Marsilia, the 16-year-old daughter of a wool carder, and soon after, she gave birth to two sons, Vittorio and Tommaso, in 1417 and 1418, respectively. Both became goldsmiths and went to work in their father's studio, but only Vittorio—who took over the business upon his father's death in 1455—stayed with the thriving firm.

Thanks to the acclaim that greeted the doors upon their completion, Ghiberti was assigned another set for the Baptistery. It is on this work—the *Gates of Paradise*—that his reputation rests today. In what is considered to be the first autobiography by a European artist, known as *I Commentarii*, Ghiberti recalled the creation of what he rightly judged to be "the most outstanding" of all his works. For the assignment, he wrote, he was "given a free hand to execute it in whatever way I thought it would turn out most perfect and most ornate and richest." With that mandate, he dispensed with traditional quatrefoils—four-lobed configurations—and instead divided the doors into ten square panels, which he surrounded with 24 figures and 24 heads. It took him 12 years to model and cast the main reliefs and another 15 to finish them. Not so much time, really, when you consider that along with the arduous work of detailing the surface of the cast

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That night we dined at Innie's, a local restaurant where the whole Innie family served as hosts. We bantered back and forth with the family (we later found out the whole country pretty much speaks English), and at the same time managed to demolish a dinner of exquisite beef and fresh seafood. So much for roughing it!

Next it was on to Shark Ray Alley where we swam with the stingrays and nurse sharks. My two teenaged boys had a ball!

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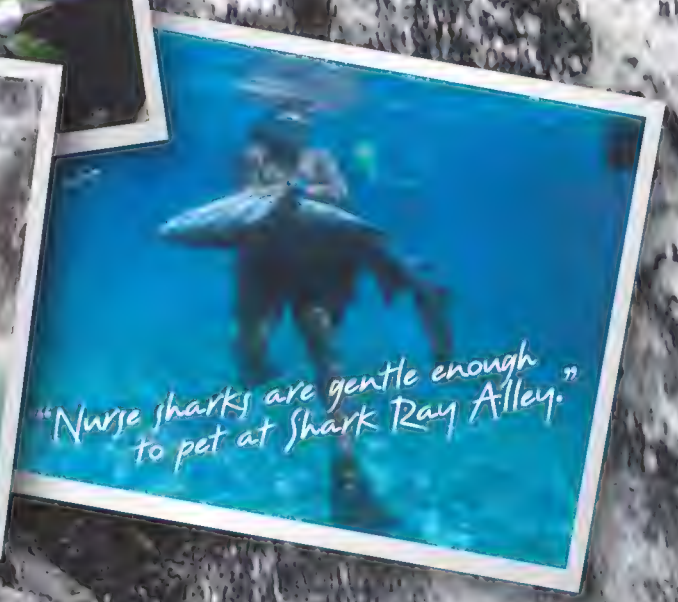
— Nora Campisi —



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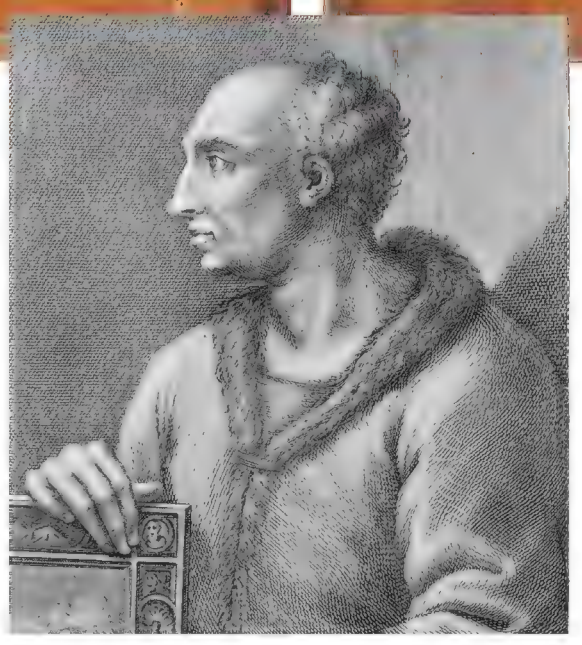

Ghiberti (left, in an 18th-century print) and the architect and sculptor Filippo Brunelleschi both sought to win a competition to create a new set of doors for the Baptistery in 1401-2. The panels they submitted for the competition (above left, Ghiberti's rendering; above right, Brunelleschi's) portrayed the sacrifice of Isaac. Both are on display in Florence's Museo Nazionale del Bargello.

bronze—the punching, hammering, incising and polishing that, collectively, is known as "chasing"—he had to come up with a new syntax for portraying a narrative.

From the first panel, set in the Garden of Eden (page 71, top), he exhibited an exuberant self-confidence with a story line that starts on the left in high relief with God animating Adam, then moves to a central scene of God creating Eve from the rib of a recumbent Adam, and ends on the right with the expulsion of Adam and Eve. Incised in low relief in the rear is the back story: the temptation of Adam and Eve by the serpent. "Up to the *Gates of Paradise*, the convention was to depict one episode per sculpture," Radke says. "It was Ghiberti's great inspiration that you could have a multiple narrative in these square windows, and that would enliven the work."

The response to the completed doors was nothing less than rapturous—so much so that Ghiberti's earlier doors were moved to allow the new ones to go in the most prominent position, on the east, facing the Duomo. There they would be one of the major artistic attractions of the city for more than five centuries.

One of the scholarly bonuses of the restoration is the new insight provided into Ghiberti's work methods. Not until the panels were removed did conservators realize that Ghiberti had cast each of the two doors, including the frames, as a single three-ton bronze piece. "Before him, nobody in Italy was able to create something in bronze so big in dimension, not since the end of the Roman Empire," says Annamaria Giusti, the director of the Museo dell'Opificio delle Pietre Dure, which is overseeing the restoration. It remains a mystery how Ghiberti learned the technique. He did not discuss it in his autobiography. "He loved to present himself as a self-made artist," she observes.

Indeed, his doors arguably afford more insight than his writings into Ghiberti's slyly playful personality. In the temptation scene in the "Adam and Eve" panel, for example, Ghiberti imported a symbol of wisdom from Roman mythology—Minerva's owl—and placed it in the apple tree. Riffing wittily in "Jacob and Esau" on the story of how the smooth-skinned Jacob impersonated his hairy brother to dupe their blind father, Ghiberti placed a pair of dogs in the foreground: one is chased with wavy lines to mimic Jacob's fleece covering, and the other is left perfectly smooth. Then there is the fascinating "Joshua" panel, which remains in Florence. To portray the crumbling of Jericho's walls before Joshua's army, Ghiberti incised deep cracks in the fortifications. Cracks! Along with holes, cracks would be the bronze artist's greatest fear. Only a man like Ghiberti, who rose immediately to the summit of his profession and stayed there, would be so insouciant as to simulate dreaded cracks in his bronze casting.

Visit Smithsonian.com/ghiberti to see more images of Ghiberti's doors.

ALINARI / ART RESOURCE, NY; ERICH LESSING / ART RESOURCE, NY; HULTON ARCHIVE / GETTY IMAGES

Johnson

A Prayer for the Ganges

Across India, environmentalists battle a tide of troubles to clean up a river revered as the source of life

BY JOSHUA HAMMER
PHOTOGRAPHS BY GARY KNIGHT

A BLUE STREAM spews from beneath brick factory buildings in Kanpur, India. The dark ribbon curls down a dirt embankment and flows into the Ganges River. "That's toxic runoff," says Rakesh Jaiswal, a 48-year-old environmental activist, as he leads me along the refuse-strewn riverbank in the vise-like heat of a spring afternoon. We're walking through the tannery district, established along the Ganges during British colonial rule and now Kanpur's economic mainstay as well as its major polluter.

I had expected to find a less-than-pristine stretch of river in this grimy metropolis of four million people, but I'm not prepared for the sights and smells that greet me. Jaiswal stares grimly at the runoff—it's laden with chromium sulfate, used as a leather preservative and associated with cancer of the respiratory tract, skin ulcers and renal failure. Arsenic, cadmium, mercury, sulfuric acid, chemical dyes and heavy metals can also be found in this witches' brew. Though Kanpur's tanneries have been required since 1994 to do preliminary cleanup before channeling wastewater into a government-run treatment plant, many ignore the costly regulation. And whenever the electricity fails or the government's waste conveyance system breaks

At Rishikesh (left), 215 miles south of Himalayan headwaters, the river is already degraded, the result of a building boom and tourist influx. Fighting pollution, says environmentalist Rakesh Jaiswal, "is not a priority for the Indian government."

down, even tanneries that abide by the law find that their untreated wastewater backs up and spills into the river.

A few yards upstream, we follow a foul odor to a violent flow of untreated domestic sewage gushing into the river from an old brick pipe. The bubbling torrent is full of fecal microorganisms responsible for typhoid, cholera and amoebic dysentery. Ten million to 12 million gallons of raw sewage have been pouring out of this drainpipe each day, Jaiswal tells me, since the main sewer line leading to the treatment plant in Kanpur became clogged—five years ago. "We've been protesting against this, and begging the [Uttar Pradesh state] government to take action, but they've done nothing," he says.

Half a dozen young fishermen standing by a rowboat offer to take us to a sandbar in the middle of the Ganges for "a better view." Jaiswal and I climb into the boat and cross the shallow river only to run aground 50 yards from the sandbar. "You have to get out and walk from here," a boatman tells us. We remove our shoes, roll up our trousers and nervously wade knee-deep in the toxic stream. As we reach the sandbar, just downstream from a Hindu cremation ground, we're hit by a putrid smell and a ghastly sight: lying on the sand are a human rib cage, a femur, and, nearby, a yellow-shrouded corpse. "It's been rotting there for a month," a fisherman tells us. The clothed body of a small child floats a few yards off the island. Although the state government banned the dumping of bodies a decade ago, many of Kanpur's destitute still discard their loved ones clandestinely at night. Pariah dogs prowl around the bones and bodies, snarling when we get too close. "They live on the sandbar, feeding on the remains," a fisherman tells us.

Sickened, I climb back into the rowboat. As we near the tanneries, a dozen boys frolic in the water, splashing in the river's foulest stretch. Jaiswal calls them over.

"Why do you swim in the river?" I ask one of the boys. "Aren't you worried?"

He shrugs. "We know it's poisonous," he says, "but after we swim we go wash off at home."

"Do you ever get ill?"

"We all get rashes," he replies, "but what can we do?"

Walking back toward the main road, Jaiswal seems despondent. "I would never have imagined the River Ganga could get like this, with stinking water, green and brown colored," he says. "It's pure toxic muck."

The 1,600-mile river is sacred to Hindus (a worshiper, below). "The Ganges," wrote Indian leader Jawaharlal Nehru in 1946, "has held India's heart captive . . . since the dawn of history."

MANAN VATSYAYANA / AFP / GETTY IMAGES; MAP: MIKE REAGAN

I shake my head at the irony. For more than two millennia, the River Ganges has been revered by millions as a symbol of spiritual purity. Originating in the frozen heights of the Himalayas, the river travels 1,600 miles across the teeming plains of the subcontinent before flowing east into Bangladesh and from there spilling into the Bay of Bengal. "Mother Ganga" is described by ancient Hindu scriptures as a gift from the gods—the earthly incarnation of the deity Ganga. "Man becomes pure by the touch of the water, or by consuming it, or by expressing its name," Lord Vishnu, the four-armed "All Pervading One," proclaims in the *Ramayana,* the Sanskrit epic poem composed four centuries before Christ. Modern admirers have written paeans to the river's beauty, historical resonance and holiness. "The Ganges is above all the river of India, which has held India's heart captive and drawn uncounted millions to her banks since the dawn of history," Jawaharlal Nehru, India's first prime minister, proclaimed.

For some time now, this romantic view of the Ganges has collided with India's grim realities. During the past three decades, the country's explosive growth (at nearly 1.2 billion people, India's population is second only to China's), industrialization and rapid urbanization have put unyielding pressure on the sacred stream. Irrigation canals siphon off ever more of its water and its many tributaries to grow food for the country's hungry millions. Industries in the country operate in a regulatory climate that has changed little since 1984, when a Union Carbide pesticide plant in the northern city of Bhopal leaked 27 tons of deadly methyl isocyanate gas and killed 20,000 people. And the amount of domestic sewage being dumped into the Ganges has doubled since the 1990s; it could double again in a generation.

"We can send a shuttle into space, we can build the [new] Delhi Metro. We can detonate nuclear weapons. So why can't we clean up our rivers?"

Rakesh Jaiswal (right) has fought polluters since 1993.

The result has been the gradual killing of one of India's most treasured resources. One stretch of the Yamuna River, the Ganges' main tributary, has been devoid of all aquatic creatures for a decade. In Varanasi, India's most sacred city, the coliform bacterial count is at least 3,000 times higher than the standard established as safe by the United Nations World Health Organization, according to Veer Bhadra Mishra, an engineer and Hindu priest who's led a campaign there to clean the river for two decades. "Polluted river water is the biggest cause of skin problems, disabilities and high infant mortality rates," says Suresh Babu, deputy coordinator of the River Pollution Campaign at the Center for Science and the Environment, a watchdog group in New Delhi, India's capital. These health problems are compounded by the fact that many Hindus refuse to accept that Mother Ganga has become a source of illness. "People have so much faith in this water that when they bathe in it or sip it, they believe it is the nectar of God [and] they will go to heaven," says Ramesh Chandra Trivedi, a scientist at the Central Pollution Control Board, the monitoring arm of India's Ministry of the Environment and Forests.

TWENTY YEARS AGO, then prime minister Rajiv Gandhi launched the Ganga Action Plan, or GAP, which shut down some of the most egregious industrial polluters and allocated about $100 million for constructing wastewater treatment plants in 25 cities and towns along the river. But these efforts have fallen woefully short. According to a 2001-2002 government survey, the treatment plants could handle only about a third of the 600 million gallons of domestic sewage that poured into them every day. (The volume has increased significantly since then). Many environmentalists say that the Ganges has become an embarrassing symbol of government indifference and neglect in a country that regards itself as an economic superpower. "We can send a shuttle into space, we can build the [new] Delhi Metro [subway] in record time. We can detonate nuclear weapons. So why can't we clean up our rivers?" Jaiswal laments. "We have money. We have competence. The only problem is that the issue is not a priority for the Indian government."

Early in 2007 the Ganges' worsening state made headlines around the world when Hindu holy men, known as *sadhus*, organized a mass protest against river filth during the Kumbh Mela festival. "The river had turned the color of Coca-Cola," says scientist Trivedi, who attended the festival and, against the advice of his colleagues at the Central Pollution Control Board, took a brief dip in the Ganges. ("I

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was not affected at all," he insists.) The sadhus called off the protests after the government opened dams upstream, diluting the fetid water, and ordered another 150 upstream industrial polluters to close. "But it was a short-term solution," says Suresh Babu. "It didn't achieve anything."

THIS PAST MAY, I followed Mother Ganga downstream for 800 miles, half its distance, to witness its deterioration firsthand and to meet the handful of environmentalists who are trying to rouse public action. I began my journey high in the foothills of the Himalayas, 200 miles south of the river's glacial source. Here the cold, pristine water courses through a steep gorge cloaked in gray-green forests of *Shorea robusta*, or sal trees. From a beach at the edge of a litchi grove below the Glass House, an inn where I stayed, I watched rafts of helmet-clad adventure-tourists sweep past on a torrent of white water .

Fifteen miles downriver, at Rishikesh, the valley widens, and the Ganges spills onto the northern Indian plain. Rishikesh achieved worldwide attention in 1968, when the Beatles, at the height of their fame, spent three months at the now-abandoned ashram, or meditation center, run by the guru Maharishi Mahesh Yogi (who today resides in the Netherlands). Built illegally on public land and confiscated by the government in the 1970s, the ruined complex rises on a thickly wooded hillside overlooking the Ganges. The place has been unoccupied ever since it was seized—an intragovernmental dispute has prevented its being sold or developed as a tourist resort—but I gave 50 rupees, about $1.25, to a guard, and he unlocked the gate for me. I wandered among derelict, stupa-like meditation chambers high above the river, which still conveyed a sense of tranquillity. Baboons prowled the ghostly hallways of the Maharishi's once-luxurious hotel and conference center, which was topped by three domes tiled in white mosaic. The only sounds were the chorusing of cuckoos and the cawing of ravens.

Along the Ganges in Kanpur (where corpses, below, are routinely discarded and tanneries, right, dump chemical waste), youngsters (bottom) still swim in these poisoned waters. Says environmentalist Jaiswal: "I would never have imagined the River Ganga could get like this. It's toxic muck."

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It's unlikely the surviving Beatles would recognize the busy, litter-strewn tourist town that Rishikesh has become. Down below the ashram, I strolled through a riverside strip of pilgrims' inns, cheap restaurants selling banana lassis and pancakes, and newly built yoga schools. A boat packed with Indian pilgrims, wild-haired sadhus and Western backpackers ferried me across the river, where I walked past dozens of storefronts offering rafting trips and Himalayan treks. A building boom over the past two decades has generated a flood of pollutants and nonbiodegradable trash. Each day thousands of pilgrims drop flowers in polyethylene bags into the river as offerings to Goddess Ganga. Six years ago, Jitendra Kumar, a local ashram student, formed Clean Himalaya, a nonprofit environmental group that gathers and recycles tons of garbage from hotels and ashrams every day. But public apathy and a shortage of burning and dumping facilities have made the job difficult. "It's really sad," Vipin Sharma, who runs a rafting and trekking company (Red Chili Adventures), told me. "All of our Hindus come with this feeling that they want to give something to the Ganga, and they've turned it into a sea of plastic."

FROM HIS BASE in Kanpur, Rakesh Jaiswal has waged a lonely battle to clean up the river for almost 15 years. He was born in Mirzapur, 200 miles downstream from Kanpur, and remembers his childhood as an idyllic time. "I used to

In Varanasi, India's holiest city (where pilgrims, right, descend to the river on ghats, or steps), millions of Hindus converge each year to bathe in the sacred waters and cremate their dead. Here, sewage is the major contaminant: a proposed $60 million treatment plant has yet to be funded.

go there to bathe with my mother and grandmother, and it was beautiful," he told me. "I didn't even know what the word 'pollution' meant." Then, one day in the early 1990s, while studying for his doctorate in environmental politics, "I opened the tap at home and found black, viscous, stinking water coming out. After one month it happened again, then it was happening once a week, then daily. My neighbors experienced the same thing." Jaiswal traced the drinking water to an intake channel on the Ganges. There he made a horrifying discovery: two drains carrying raw sewage, including contaminated discharge from a tuberculosis sanitarium, were emptying right beside the intake point. "Fifty million gallons a day were being lifted and sent to the water-treatment plant, which couldn't clean it. It was horrifying."

At the time, the Indian government was touting the first phase of its Ganga Action Plan as a success. Jaiswal knew otherwise. Kanpur's wastewater treatment plants broke down frequently and could process only a small percentage of the sewage the city was producing. Dead bodies were being dumped into the river by the hundreds every week, and most of the 400 tanneries continued to pour toxic runoff into the river. Jaiswal, who started a group called EcoFriends in 1993 and the next year received a small grant from the Indian government, used public outrage over contaminated drinking water to mobilize a protest campaign. He organized rallies and enlisted volunteers in a river cleanup that fished 180 bodies out of a mile-long stretch of the Ganges. "The idea was to sensitize the people, galvanize the government, find a long-term solution, but we failed to evoke much interest," he told me. Jaiswal kept up the pressure. In 1997, state and local government whistleblowers slipped him a list of factories that had ignored a court order to install treatment plants; the state ordered the shutdown of 250 factories, including 127 tanneries in Kanpur. After that, he says, "I got midnight phone calls telling me, 'you will be shot dead if you don't stop these things.' But I had friends in the police and army who believed in my work, so I never felt my life was in real danger."

Jaiswal's battle to clean up the Ganges has achieved some successes. Largely because of his corpse-cleanup drive, a cemetery was established beside the Ganges—it now contains thousands of bodies—and a ban was enforced, obviously often violated, on "floaters." In 2000, the second phase of the Ganga Action Plan required 100 large- and medium-sized Kanpur tanneries to set up chrome-recovery facilities and 100 smaller ones to build a common chrome-recovery unit. Enforcement, however, has been lax. Ajay Kanaujia, a government chemist at Kanpur's wastewater treatment facility, says that "some tanneries are still putting chrome into the river without any treatment or dumping it into the domestic sewage system." This treated sewage is then channeled into canals that irrigate 6,000 acres of farmland near Kanpur before flowing back into the Ganges. India's National Botanical Research Institute, a government body, has tested agricultural and dairy products in the Kanpur area and found that they contain high levels of chromium and arsenic. "The irrigation water is dangerous," Kanaujia says.

I'M IN A MOTORBOAT at dawn, putt-putting down the Ganges in Varanasi, where the river takes a turn north before flowing into the Bay of Bengal. Called Benares by the British, this ancient pilgrimage center is the holiest city in

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India: millions of Hindus come each year to a three-mile long curve of temples, shrines and bathing ghats (steps leading down to the river) along its banks. With a boatman and a young guide, I cruise past a Hindu Disneyland of Mogul-era sandstone fortresses and green, purple and candy cane-striped temples. None of the pilgrims sudsing themselves in the Ganges, bobbing blissfully in inner tubes or beating their laundry on wooden planks, seem to pay the slightest attention to the bloated cow carcasses that float beside them—or to the untreated waste that gushes directly into the river. If toxic industrial runoff is Kanpur's special curse, the befouling of the Ganges as it flows past the Hindus' holiest city comes almost entirely from human excreta.

The boat deposits me at Tulsi Ghat, near the upriver entrance to Varanasi, and in the intensifying morning heat, I walk up a steep flight of steps to the Sankat Mochan Foundation, which, for the past two decades, has led Varanasi's clean-river campaign. The foundation occupies several crumbling buildings, including a 400-year-old Hindu temple high over the Ganges. I find the foundation's director, Veer Bhadra Mishra, 68, sitting on a huge white cushion that takes up three-quarters of a reception room on the temple's ground floor. Draped in a simple white *dhoti*, he invites me to enter.

Mishra looks at the river from a unique perspective: he is a retired professor of hydraulic engineering at

Banaras Hindu University and a *mohan*, a Hindu high priest at the Sankat Mochan Temple, a title that the Mishra family has passed from father to eldest son for seven generations. Mishra has repeatedly called the Ganga Action Plan a failure, saying that it has frittered away billions of rupees on ill-designed and badly maintained wastewater treatment plants. "The moment the electricity fails, the sewage flows into the river, and on top of that, when the floodwaters rise, they enter the sump well of the sewer system pumps and stop operations for months of the year," he tells me. (Varanasi currently receives only about 12 hours of power a day.) Moreover, he says, engineers designed the plants to remove solids, but not fecal microorganisms, from the water. The pathogens, channeled from treatment plants into irrigation canals, seep back into the groundwater, where they enter the drinking-water supply and breed such diseases as dysentery, as well as skin infections.

A decade ago, Mishra, with hydraulic engineers and scientists at the University of California at Berkeley, designed a water-treatment scheme that, he says, is far better suited to Varanasi's needs. Known as an "advanced integrated wastewater pond system," the process relies primarily on gravity to carry domestic sewage three miles downstream to four huge pools where oxygen-enriched bacteria break it down and pathogens are killed by sunlight and natural atmospheric action in a "maturation" pond. The projected cost of the system, which has been endorsed by the Varanasi municipal government, is $60 million.

Mishra was named one of *Time* magazine's Heroes of the Planet in 1999; in 2000, President Clinton praised him for his environmental work. But in spite of the honors that have come his way, Mishra has grown discouraged. The national government and the state government of Uttar Pradesh, which would have to fund the wastewater project, have openly opposed it on grounds ranging from doubts about the proposed technology to objections that treatment ponds would lie in a flood plain.

Meanwhile, the city's population keeps growing—it has doubled to three million in a generation—along with the bacteria count. Mishra says he's especially concerned for the future of India's most devout Hindus, whose lives are entirely focused on Mother Ganga. He calls them an endangered species. "They want to touch the water, rub their bodies in the water, sip the water," he says, "and someday they will die because of it," admitting that he himself takes a dip in the river every morning. "If you tell them 'the Ganga is polluted,' they say, 'we don't want to hear that.' But if you take them to the places where open sewers are giving the river the night soil of the whole city, they say, 'this is disrespect done to our mother, and it must be stopped.'"

But how? Suresh Babu of the Center for Science and the Environment in New Delhi believes that if municipalities were obliged to draw their drinking water from downstream rather than upstream, "they would feel an obligation" to keep the river clean. But growing pressures on the Ganges seem destined to outstrip all efforts to rescue it. By 2030, according to Babu, India will draw eight times the amount of water from the Ganges it does today. In the same time, the population along the river and its tributaries—up to 400 million, or one-third of India's total population—could double. Trivedi admits that the government "lacks a single coherent plan" to clean up the river.

RAKESH JAISWAL TELLS ME that after all the years of small achievements and large setbacks, he finds it difficult to remain optimistic. "My friends tell me I've made a difference, but the river looks worse today than when I started," he says. In 2002, the Ford Foundation gave him enough money to hire 15 employees. But the next year, when the foundation cut its Environmental Equity and Justice Program, Jaiswal had to let his staff go and now works with one assistant out of a bedroom in his sister's house near the river. On his dresser stands a framed photograph of his wife, Gudrun Knoessel, who is German. In 2001, she contacted him after seeing a German TV documentary about his work; a long-distance courtship led to their marriage in 2003. They see each other two or three times a year. "She has a job in Baden-Baden," he explains. "And Kanpur needs me." So he often tells himself. But sometimes, in darker moments, he wonders if anybody really cares.

India's most devout Hindus "want to touch the water, rub their bodies in it, sip the water, and someday they will die because of it."

In Varanasi, Veer Bhadra Mishra (left) heads cleanup efforts.

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For more about environmental issues in India, see Smithsonian.com/ganges.

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ON THE PROWL

Long absent from the United States, a few jaguars now roam the wilds along the border with Mexico. How will the crackdown on illegal immigrants affect the big cats?

BY JEREMY KAHN

IMPERIAL SAGUARO CACTUSES EMBRACE THE ARIZONA SKY WITH THORN-STUDDED LIMBS, presiding over a realm of spiny ocotillos, prickly pear, cat's-claw and all manner of skin-shredding brush. Halfway up a rock-strewn trail, a young wildlife biologist named Emil McCain kneels next to a metal box affixed to a gnarled oak. The box was designed to thwart the errant curiosity of wandering bears, but McCain has found it stands up equally well to wandering humans. The box houses a digital camera equipped with a heat and motion sensor that snaps photographs of whatever moves on the trail; the camera has taken 26 shots since McCain last checked it a month ago. Viewing them, he scrolls through a veritable catalog of local wildlife: jack rabbit, white-tailed deer, rock squirrel, javelina (a sort of wild boar), coyote, bobcat, a woman in hiking boots. Suddenly, he looks up, an impish grin spreading across his face. "Hey, you guys, you wanna see a jaguar?"

The jaguar is not supposed to be here. Not in the United States. Not in 2007. And certainly not in the desert thorn scrub that wildlife biologists said was too harsh and too dry to contain enough prey for a jaguar to live on. But here he is nonetheless, his golden hide adorned with large black rosettes and his muscular, feline form unmistakable in the images captured by McCain's camera.

This jaguar is one of four that have been documented in the United States over the past decade. Some think that others live undetected in the wilds of Arizona and New Mexico. Once thought to have vanished from the United States, the cats' presence has set off an intense debate about how to ensure their survival in the American landscape. Along the way, encounters with the jaguar have transformed an unlikely group of cattle ranchers and hunters into avowed conservationists. And the animal has become ensnared in many of the West's thorniest political fights: the battles over grazing rights, development, mining and efforts to seal the U.S. border with Mexico.

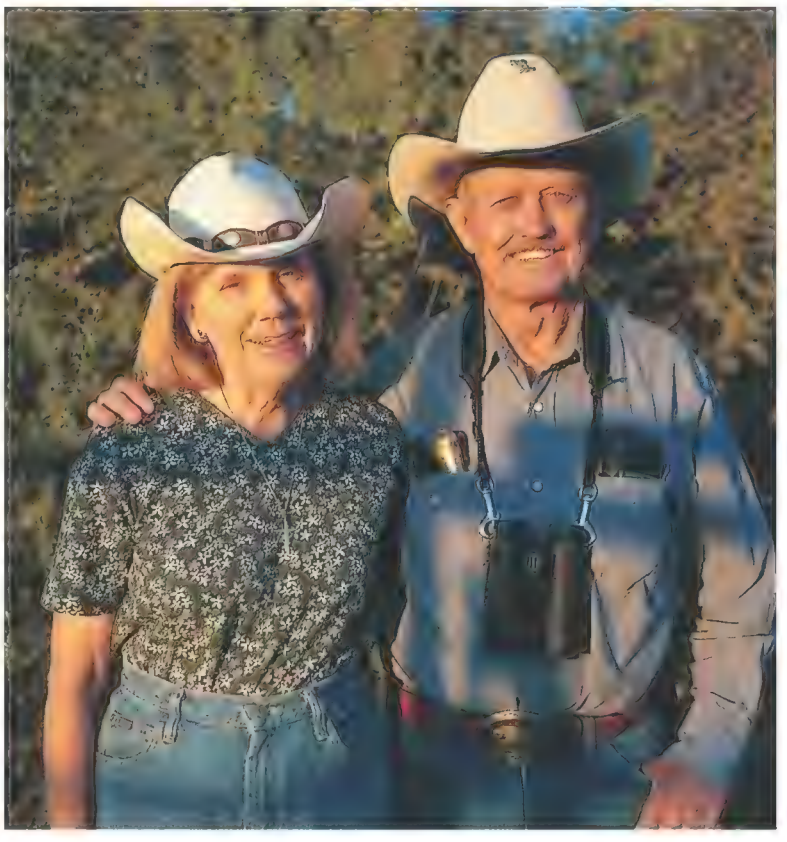
The jaguar is the Western hemisphere's largest feline and the third largest cat in the world; only lions and tigers are bigger. It's also the only cat in the hemisphere that roars (although the noise is often likened to a cough). It once ranged widely through much of the Americas, from the

Biologist Emil McCain (inset) says that if "another jaguar" were to appear, it would most likely be in the green area of the map, above.

SCOTT BELL; MAP: MIKE REAGAN AND ERIK WASHAM; P. 84 FRANS LANTING / MINDEN PICTURES

pampas of Argentina to the rain forests of the Amazon and Central America and up through the mountains of Mexico into present-day Texas, New Mexico and Arizona. But the growth of cattle ranches, logging and mining operations, combined with extensive trapping and hunting, brought the cat to the brink of extinction in much of its range. By 1900, jaguars were fairly uncommon in the United States and sightings became rarer still as the decades progressed. In 1963, a female jaguar was killed by a hunter in Arizona's White Mountains. As far as anyone knows, no other female has been seen since in this country. In 1969, Arizona outlawed the killing of jaguars. But over the next 25 years only two animals, both males, were documented in the United States—and both were shot by hunters.

Then, in 1996, something remarkable happened. In two separate incidents, mountain lion hunters stumbled upon jaguars in Arizona and New Mexico—and reached for cameras rather than rifles. Warner Glenn, whose hounds bayed a jaguar on a cliff in the Peloncillo Mountains of southern New Mexico in March of that year, says the thought of shooting the animal never crossed his mind. "I tell you, it would have had to be a terrible situation for me to kill one, because why would you? They are so doggone rare, and that's the first one I ever saw," says Glenn. So he snapped away with his camera, edging ever closer to the cat as he tried to retrieve his hounds. He got a little too close. The jaguar charged him. In a split second, Glenn's hounds leapt between him and the cat, thwarting its attack. The jaguar slunk away, and Glenn rode out of the canyon with the first photos ever taken of a living, wild jaguar in the United States. Almost six months later and 150 miles to the west, Jack Childs and Matt Colvin, two mountain lion hunters, treed a large male jaguar. They, too, photographed the animal and called off the hounds. These two meetings of man and cat would have lasting personal and political consequences.



Surveyor Jack Childs (with wife, Anna) founded the Jaguar Detection project after coming across a big cat in 1996.

For Jack Childs, a retired land surveyor, his encounter with *el tigre*—as the jaguar is known in Mexico—launched him on a second career as a researcher. He traveled to Brazil's Pantanal to study the cat in the heart of its range, later publishing a field guide on how to differentiate the signs—such as tracks, scat (fecal matter) and kill remains—of various cats native to the Southwest. Childs went on to found the Borderlands Jaguar Detection Project, a nonprofit organization dedicated to investigating jaguars along the border between Arizona and Mexico. In March 2001, he began putting trail cameras in areas where jaguars had historically been sighted; in December of that year, his cameras captured images of a jaguar.

A jaguar's spot pattern is unique, a bit like human fingerprints or the fluke patterns of humpback whales. This enables scientists to identify individual cats. But because a jaguar's left and right patterns are different, a positive ID from a photograph requires a researcher to be looking at the same side of the animal. Sex determination from trail camera photos can also be tricky: male and female jaguars look a lot alike, and not even male genitalia can always be seen in photographs. In this case, Childs was certain he was looking at a male, and that it was a different animal than either of the ones he or Glenn had run across in 1996. He dubbed this new jaguar Macho A, using the Spanish for male.

In 2004, Emil McCain joined Childs' Borderlands Jaguar Detection Project. McCain, who is studying for a master's degree in wildlife management at Humboldt State University in California, had worked on jaguar studies in Costa Rica and Mexico. With his neatly trimmed red beard and mustache, he bears an odd resemblance to Vincent van Gogh. A skilled traditional bowhunter and falconer, the 29-year-old McCain and the 65-year-old Childs immediately connected. McCain helped find funding for more trail cameras and increased the number of locations he and Childs were surveying. This paid off: not only did McCain and Childs capture an additional photograph of Macho A, but they soon found a second jaguar in the Coronado National Forest, whom they called Macho B. Remarkably, when McCain analyzed Macho B's spots, he discovered that this was the same jaguar that Childs and Colvin had treed eight years earlier.

McCain also uncovered something else: a possible third jaguar, photographed twice in September 2004 and again in December 2004. The images may simply show the left side of Macho A (who was photographed only from the right and who has not been sighted since 2004). McCain, however, thinks this is a different individual—for one thing, the tail markings don't seem to match. Unless the cat is photographed again, however, there's no way to know for sure.

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Over the past two years, McCain and Childs have tracked Macho B year-round. They know he moves across an enormous territory, covering at least 525 square miles. They once documented him in the course of a single night traveling 13 miles over extremely rugged terrain and have trailed him across the Mexican border. The project's camera studies also have yielded information about species from mountain lions to the raccoon-like coati. But besides Macho A, Macho B and the possible third cat, they have not captured photos of any other jaguars. McCain wonders if there's a female out there. "Would a mature male like Macho B stick around if there weren't a female somewhere nearby?" he asks. A female could be evidence of a breeding population—something some biologists doubt exists in the United States—and would increase pressure on the government to do more for jaguar conservation.

There are at least seven mountain ranges in Arizona and New Mexico where jaguars were historically sighted that have yet to be surveyed. Additionally, a panel of scientific advisers to a jaguar conservation team (with representatives from the Arizona Game and Fish Department and other government agencies) recommended last year that a jaguar be trapped and fitted with a satellite tracking collar. That would enable scientists to identify exactly what pathways the cat was traversing between mountain ranges and where and how often it crossed into Mexico. It also might enable researchers to locate other jaguars—including possibly those elusive females—if they exist. But game officials are still evaluating the plan.

One area where scientists have yet to look for jaguars is the Animas Mountains in New Mexico. On February 20, 2006, Warner Glenn and his daughter were leading a mountain lion hunt there when one of his dogs, Powder, went missing. Powder soon reappeared, but with a gaping hole in his neck and shoulder. "Something had whipped the dickens out of him," Glenn says. At the same time, the rest of Glenn's pack took off down the face of a bluff after something.

Glenn watched from the ridge as the dogs surrounded a cedar tree across the canyon. Worried that his pack had struck out after a feral hog, Glenn piloted his mule off the steep ridge, "sliding mostly," he says. "The boulders were rolling and the brush was popping." But when he got within 100 yards of the cedar, lo and behold, he saw a big cat sitting there. In the shade, it looked chocolate brown, and Glenn assumed it was a large male mountain lion. Suddenly, the cat charged out into the sun after the dogs, and Glenn saw it had dusky gold fur and spots. "I said, my gosh, it's a jaguar!" Glenn recalls.

Hunters can spend a lifetime in the Southwest and never see a jaguar. Now Glenn had stumbled across his second cat in a decade. Glenn calls this one Border King. Based on the weathering of its teeth, seen in Glenn's photos, Border King is thought to be an 8- to 9-year-old male, weighing as much as 200 pounds.

Trail cameras (inset) have documented that Macho B (first photographed in 2004, left) roams a vast Southwestern territory—at least 525 square miles.

Border King was the fourth confirmed jaguar in the United States. Glenn has not seen him since but thinks he and others are probably out there, haunting the isolated mountain ranges that run south to the border and into Mexico's Sierra Madre. "It's a wonderful wildlife corridor," he says. "The prey base is just number one." And Glenn thinks the cattle that also graze there are part of the reason it's such good jaguar habitat: the cattle rancher who owns the land runs pipelines and wells that provide water for his livestock, but also for wildlife.

AT 71, GLENN IS A LEGEND in this corner of the Southwest. A fourth-generation cattleman, he grew up tracking mountain lions with his father and has spent his whole life guiding professional hunts. Tall and lean and as leathery as

EMIL MCCAIN (2)

cowhide, Glenn looks like he stepped out of a "Bonanza" episode. But beneath his cowpoke exterior lurks a media-savvy and politically astute businessman.

Two years before his jaguar sighting in the Peloncillos, Glenn and his wife, Wendy, and some neighbors formed a group to advocate for ecologically sound range management. The motivation was to alter growing public perceptions of ranchers as poor stewards of the environment and pre-empt political pressure to further restrict grazing on public lands. Grazing limits—quotas on the number of cows a rancher can run and rules on how frequently he has to rotate pastures—were hard on cattle ranchers. And perversely, according to Glenn, they also harmed the very environment they were supposed to protect by forcing many ranchers to close up shop and sell out to developers, who then subdivided the land for housing, ruining wildlife corridors.

The Malpai Borderlands Group (derived from the Spanish word for "badlands," Malpai is the name of Glenn's ranch, where the group maintains its office) now encompasses nearly a million acres of southeastern Arizona and southwestern New Mexico. It has pioneered a host of innovative land management techniques. These include payments to ranchers in exchange for conservation easements that guarantee their land will never be subdivided.

Glenn expected that his jaguar photos would be controversial. For a lot of ranchers in this part of the country, the accepted wisdom for how to handle an endangered species—especially a potential calf-killer—is "shoot, shovel and shut up." After all, the thinking goes, rare wildlife brings only more grazing restrictions. But when Glenn showed his jaguar photos to the Malpai members, the group decided to go public with Glenn's sighting. "We talked it over, and we thought it was kind of a neat thing," Glenn says. The Malpai ranchers viewed the jaguar as a sign of the health of their land.

Not everyone thought they made the right call. In 1972, the U.S. Fish & Wildlife Service (FWS) had listed the jaguar as endangered, but only south of the border. For two decades the service had successfully resisted efforts by environmentalists to make it list the United States as part of the jaguar's range, which could lead to new limits on cattle ranching on public lands and hunting in parts of Arizona and New Mexico if the area were declared "critical habitat" for the jaguar. Now, other ranchers feared, Glenn's photographs would force the government's hand.

Rancher Warner Glenn (with wife, Wendy) is pro jaguar: "Why [kill one]?" he asks. "They are so doggone rare."

Sure enough, Glenn's sighting, combined with Childs and Colvin's encounter, led to litigation that forced the federal government in 1997 to list the jaguar as endangered in the United States. But in a nod to the ranchers' concerns, the FWS decided that it was "not prudent" to designate any particular areas "critical habitat" for the cat, arguing that the biggest danger the jaguar faced was illegal hunting, not habitat loss.

The FWS's position remains controversial. Last summer, the Center for Biological Diversity, the group whose lawsuit forced the government to list the jaguar as endangered, filed another suit intended to force the federal government to designate critical habitat and institute a recovery plan for the species.

The phrase "critical habitat" stokes the anger of ranchers. "All these groups want to get cattle off the federal lands—period," says Sue Krentz, a cattle rancher near the Glenns. She says that ranchers get little credit for their contribution to the environment. "We provide water and prevent the fragmentation of rangeland, now all you want to do is punish us because we happen to run a cattle ranch," she says. Krentz thinks the attention paid to the jaguar is disproportionate to the number of animals seen. Referring to Macho B, she says, "remember we are only talking about one jaguar here—all of this is just about one jaguar. If we did this much work with kids, they would all be able to read."

Ranchers opposed to critical habitat designation have some powerful allies. The Wildlife Conservation Society's Alan Rabinowitz is considered one of the world's leading authorities on jaguars. Rabinowitz thinks the jaguars that have been sighted in the United States in recent times are mostly transients. "There is no resident population in the U.S.," he tells me. "And no evidence of breeding."

Carlos López González, a Mexican jaguar expert, and David Brown, a wildlife biologist at Arizona State University, came to the same conclusion in their 2001 book, *Borderland Jaguars*, a history of the jaguar in the southern United States and northern Mexico. They postulate that the jaguars in the U.S. wander up from the northernmost known breeding population in Mexico, which lies 140 miles south of the border in Sonora. Jaguars are solitary animals and as young adults must strike out to find their own territory.

Although McCain disagrees with Rabinowitz that the U.S. jaguars are visitors, he is not in favor of designating

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critical habitat for them. That, he tells me, will only pit ranchers against cats. "The problem is that it makes the jaguar the enemy," he says. "And if that happens, we'll never have another jaguar sighting in this country." Even now, rumors of ranchers offering bounties for trapping jaguars on their property still circulate in southern Arizona.

RANCHERS' HISTORIC ANIMOSITY toward a predator like the jaguar doesn't dissipate easily. But, thanks in part to the conservation efforts of Childs and Glenn, attitudes are starting to change. Dan Bell, who runs the day-to-day activities of the family's ZZ Cattle Corporation, was none too pleased when Childs began documenting jaguars moving through his ranch in December 2001. "That was kind of a shock because, we were just like, 'Oh, no, now what? What do we do?'" Bell says. "I was just thinking a calf-eating machine right there. That was my first thought."

Childs and his old hunting partner Matt Colvin, who also volunteers on wildlife studies, tried to put Bell's mind at ease: the pair would investigate any suspicious kills and ensure that Bell received fair compensation. (One way to tell a jaguar kill: they like to eat a victim's tongue and ears first; mountain lions start with the heart and liver.) Bell also began attending jaguar conservation meetings. There, he says, his worry about predation subsided. But it was supplanted by a new fear: the talk of critical habitat.

In 2006, in New Mexico's Animas Mountains, Glenn photographed a male (above) he called Border King—"a big old magnificent-looking cat."

Bell, 39, still worries that the jaguar will be invoked to force further limits on his herd. But he continues to host jaguar researchers on his Forest Service allotment. He hopes McCain and Childs' photographs, not just of the jaguar, but of all the other species—from turkeys to bears to skunks—will help convince people that ranches can be important wildlife corridors as well as bulwarks against urban sprawl. "People just need to realize that these ranches are providing other benefits," he says. The alternative, he insists, is condos and golf courses.

McCAIN AND I BOUNCE down a rutted dirt track in the Coronado National Forest, each spine-jarring lurch of his ATV bringing us closer to the canyon floor and the edge of the United States. At the bottom of the gulch, rusty steel rails—stacked and welded into an interlocking lattice as high as a man's chest—zigzag across the orange sand like a zipper drawn across the desert floor. This is "the wall"—part of the 700-mile-long border partition the U.S. government is building to stem the tide of illegal immigrants and drug traffickers who use these canyons to enter the country. But it may also seal the fate of the jaguar in the United States. "I don't think the jaguar stands a chance if there is a fence," McCain says. Jennifer Neeley, formerly the Southwest representative of the environmental group Defenders of Wildlife in Tucson, agrees. "When the wall goes up, jaguar recovery will end," she tells me.

The wall is solid mainly near major cities. Here, in the mountains, the government has opted for this lattice construction—called a Normandy barrier because it looks a bit like the obstacles that greeted Allied forces on D-Day beaches. It's intended to stop vehicles from driving across the border. That forces illegal migrants to enter on foot, theoretically making them easier to catch. But because an animal can go under or over the steel rails, it is also supposed to be more wildlife-friendly than a traditional wall.

McCain isn't so sure. He's tracked Macho B crossing the border at this very spot. "Just because it's possible for an animal to go through here doesn't necessarily mean they will," he tells me as he surveys the long line of steel. He thinks animals, including jaguars, might be too intimidated to cross. The Border Patrol is also expanding solid pedestrian fencing by 31 miles near Nogales, Naco and Douglas, Arizona, including a stretch that borders much of the Buenos Aires National Wildlife Refuge. It is also clearing 225 adjacent acres in order to patrol the fence line. In late August, the FWS issued an opinion that this fencing could act as a deterrent and "preclude jaguar movement into the U.S." Still, the FWS, acting on its belief that no breeding population exists in the United States, concluded that fencing would not affect the survival or recovery of the species. The fence construction continues.

Illegal traffic moving through the remote deserts of southern Arizona poses a conundrum for conservationists. Migrants disturb wildlife and pollute pristine areas with garbage and human waste. (In wooded areas or caves where illegal migrants hide out, knee-deep piles of refuse are sometimes left behind.) But fencing and the Border Patrol's trucks and ATVs pose equal—some say greater—risks to the

WARNER GLENN

fragile ecosystem. Most environmentalists say they would welcome a policy that would staunch the flow of migrants across the desert. With immigration reform going nowhere in Congress, however, such a solution does not seem likely any time soon. In the meantime, critics say the fences simply push immigrants into wilder areas. "We have not stopped a single person from coming into this country," says Neeley. "All we've done is move where they are crossing from urban areas into rural and remote areas."

Immigrants and drug traffickers use many of the same trails as jaguars. Each month, McCain discovers at least one of his cameras smashed. In response, he has taken to posting signs near the cameras in English and Spanish telling people that the photos are used only for wildlife studies. (He deletes those of people.) One volunteer for the Borderlands Jaguar Detection Project began putting small cards bearing the images of the Virgin of Guadeloupe and various saints by the cameras as a sign of goodwill in the hopes that migrants and drug runners will be less likely to damage them. McCain has also found that switching to infrared cameras—which use a flash not visible to humans—cuts down on camera vandalism.

In Arizona, killing a jaguar was legal until 1969 (above, a 1964 hunter). By then, few were left.

ONE EARLY MAY DAY, McCain and I hike down a rocky, brush-filled canyon several miles from Nogales, working our way toward the Mexican border past flowering yellow columbine and blooming white poppy thistle (and large clusters of poison ivy). McCain's dog Poncho races past, scaring some Montezuma quail into sudden, cooing flight. High up, a golden eagle searches lazily for its next meal. In the relatively wet canyon bottom, large oaks, sycamores and junipers have taken root. This is what biologists call a "riparian zone"—classic jaguar habitat. "If another jaguar is going to move into this country, it's going to happen right here," McCain says as he checks one of his cameras. But instead of sighting a jaguar, we hear shouting: a young Mexican man, scratched from head to toe from a fall through the brush and suffering a broken ankle, is screaming for help. We leave him some fresh water and promise to call the Border Patrol. (The man will be rescued by helicopter later that night.)

Encounters like these trouble McCain. He has documented both Macho A and Macho B in this canyon. But earlier this year, Macho B made a surprising move to a mountain range dozens of miles away. McCain wonders if the ongoing cat-and-mouse game between the Border Patrol, Mexican "coyotes" and drug traffickers has pushed the jaguar out.

Defenders of Wildlife has worked with other local conservation groups to create sophisticated maps of probable jaguar migration corridors. The groups hope to persuade the Border Patrol and the Department of Homeland Security to rely more heavily on so-called "virtual fences"—high-tech remote sensors and cameras that monitor the border without a physical barrier. But so far, they have had little success. "There is absolutely no table to sit at with the Department of Homeland Security that is meaningful in any way," Neeley says.

The Border Patrol maintains that its efforts ultimately save the environment. "If we are not patrolling that area, then there is going to be a lot more illegal traffic coming through," says Shannon Stevens, public information officer for the Border Patrol's Tucson Sector. "Illegal traffic leaves much more footprint than a Border Patrol agent would." She emphasizes that the Tucson Sector has to contend with a tidal wave of illegal migrants—it had already apprehended 295,700 of them this year as of September.

WHILE CHECKING McCain's cameras in the border canyons, we frequently catch sight of colorful plastic ribbons fluttering in the breeze: pink, blue, orange and yellow streamers attached to wooden stakes in the ground. "A lot of these are new since the last time I was here," McCain says. These are claim stakes, and they signal another looming threat for the jaguar: a mining boom.

A recent surge in mineral prices, driven by demand from China and India, coupled with technological advances, has made it economically viable for miners to return to the Arizona mountains they largely abandoned after World War II. Prospectors have rushed to restake old claims throughout the state, including in areas where jaguars have recently been documented. The miners are aided by an 1872 mining law that makes it extremely cheap to stake a claim on public land and gives priority to mining over almost any other activity. Mining companies doing exploratory work have already built new roads into forested mountainsides.

In the Patagonia and the Santa Rita mountains, home to rare birds such as the spotted owl and the Apache Goshawk—and a place where large numbers of jaguars were once killed by hunters—conservationists and ranchers have joined together to fight a proposed open-pit copper mine. "This is a critical area of potential prey base for the jaguar," McCain says. Unlike ranching, which does not have much impact on wildlife when carried out responsibly, mining is noisy, industrial work that can frighten off animals and alter

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an entire landscape. Many conservationists hope that if McCain can succeed in documenting a jaguar in these mountains, it will provide a basis to stop the mining.

So far, McCain has photographed plenty of bears and mountain lions, coatis and gray fox. But no jaguar has crossed his viewfinders in the Patagonias. McCain did, however, find some claw scrapes that he doesn't think were made by a mountain lion. "I suspect that there's one out here," McCain says. But he needs proof. Eventually, he hopes DNA analysis of scat or hair samples collected in the field will confirm his hunch.

ULTIMATELY, THE FATE of the jaguar in the United States is bound to its fate in Mexico. And there the cat is in trouble. Killing jaguars is illegal in Mexico, but the law is not well enforced. The jaguar population in Sonora, home of the confirmed breeding population closest to the border, is estimated to be no more than 150 individuals. Conservationists say they have reports of as many as 30 jaguars killed in Sonora within the past five years.

A number of U.S. conservation groups have stepped in to try to save the Sonoran jaguars, with the hope that a healthy population there will eventually spread into the United States. In 2003, the Tucson-based Northern Jaguar Project helped the Mexican conservation group Naturalia purchase Rancho Los Pavos, a 10,000-acre spread near the junction of the Aros and Bavispe rivers, to serve as a jaguar reserve. Now the Northern Jaguar Project is trying to raise $1.7 million to purchase an adjacent 35,000-acre ranch. The project, along with Defenders of Wildlife, has also launched an innovative program in which it provides trail cameras to Mexican ranchers and pays them for photographs of wild cats: $300 for a jaguar, $150 for an ocelot and $100 for a mountain lion—all significant sums in impoverished Sonora. The idea is to give ranchers a financial incentive to let rare predators live on their land.

Some biologists, however, think that maintaining the Sonoran population will hardly ensure the jaguar's return to the United States. "You can sit around and wait for a female to show up from 120 miles away, but it is a pretty outside chance," says Arizona State University's David Brown. "If you are really serious about managing the jaguar population, you have to introduce a female or two and see what happens." Though conservation groups such as Defenders of Wildlife and the Center for Biological Diversity support the idea, state and federal authorities have so far refused to consider a reintroduction.

McCain says jaguars "don't stand a chance" in the United States if border fences stay in place.

In the meantime, conservationists in the United States have been working to protect those jaguars that do make it over the border. In an effort to get ranchers to view the cats as less of a threat, the Malpai Borderlands Group has pledged to reimburse them for any livestock the animals kill. The group made the first such payment—$500—to a rancher who lost a calf earlier this year. Ranchers are also being encouraged to use simple techniques—such as birthing all their cows at the same time and keeping calves away from areas where predators are known to be active—to minimize losses. In July, Arizona congressman Raúl Grijalva introduced a bill to set aside 83,400 acres of mountains and rolling grassland northwest of Nogales as the Tumacacori Highlands Wilderness Area. The land would be off-limits to mining, development and recreational use by motorized vehicles.

Eco-friendly tourism may help, as well. The town of Ruby, located between Nogales and Arivaca, is a remnant of Arizona's mining past. Despite attempts to reclaim its sandy, white mine tailings and a brief stint as a hippie colony in the late 1960s, Ruby functions today only as a ghost town frequented by occasional tourists. Howard Frederick, an animal nutritionist whose family owns Ruby, plans to turn the place into a biological reserve. And he is excited that McCain and Childs have documented the jaguar in the surrounding canyons. "If they wanted to make Ruby a home, that would be great," Frederick says.

One night back at the remote ranch house that McCain uses as a field base, he lectures on the borderland jaguars to members of the socially prestigious Tucson Rodeo Parade Committee. The group consists mostly of city slickers, but they are clearly captivated by his presentation. After McCain concludes, several people approach him and offer to work as volunteers for the Borderlands Jaguar Detection Project. One man asks why Arizona Game and Fish has not done more to publicize the presence of the cat. "It's just amazing to think this animal is out there," he tells McCain.

That seems to be the way it goes with the jaguar. To a lot of people, the idea that such a majestic and mysterious creature stalks the high desert touches something primal within, inspiring an appreciation for all that is still wild and unfettered by man. And if the jaguar disappears again, a victim of development or mining or a belief that a wall can prevent supply from meeting demand, then it won't be just the great spotted cat that suffers. For with the jaguar will go another piece of what little remains of the untamed soul of the American West.

MATT YORK / AP IMAGES

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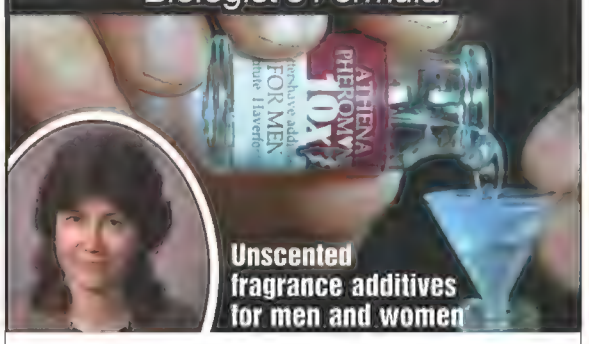

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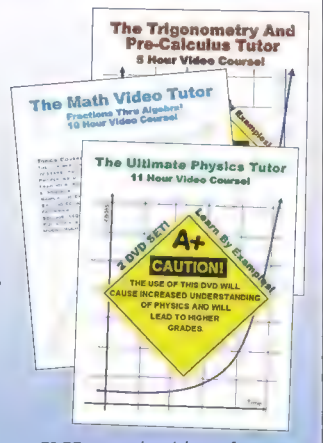
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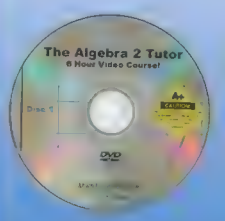

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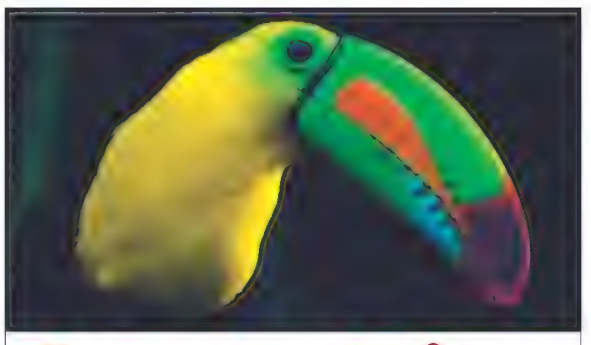

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Point. Shoot. See

In Zambia, a New York City photographer teaches kids orphaned by AIDS how to take pictures. They teach him a lesson about living

BY JESS BLUMBERG

KLAUS SCHOENWIESE traveled down the road eight miles north of Lusaka, Zambia, through soft hills, still lush from the rainy season, and fields of maize that were beginning to dry. Charcoal sellers whizzed by on bikes. His Land Cruiser turned at a sign marked CCHZ. Along this rutted, dirt road were a few small farmhouses, open fields of tomatoes and a fluttering flock of blue finches.

Another turn took him to the Chishawasha Children's House of Zambia, an orphanage and school. In a yard shaded by low trees, Schoenwiese barely had time to step outside of his SUV before he was bombarded with hugs. "Uncle Klaus!" the kids shouted.

Schoenwiese, a 43-year-old native of Germany who lives in New York City, is a photographer specializing in travel and portrait work. He went to Chishawasha this past May with the backing of the New York City-based Kids with Cameras, which sponsors photography workshops for disadvantaged children. The organization was made famous by the Oscar-winning documentary "Born into Brothels," about its work with the children of Calcutta prostitutes.

The Chishawasha facility and its sister nonprofit organization, the Zambian Children's Fund, were founded in 1999 by Kathe Padilla of Tucson, Arizona, to serve children orphaned by AIDS. Chishawasha's three new concrete and mud-brick

© 2007 KLAUS SCHOENWIESE (2); P. 97 MAP: MIKE REAGAN; CHARLES CHIKUNI / © 2007 KLAUS SCHOENWIESE

residences—the name Chishawasha means "that which lives on" in the local Bemba language—currently house 40 children, ages 3 to 19; another 50 children attend the school, which goes through the sixth grade. Zambia is one of the world's poorest nations, with about two-thirds of its population of 11 million subsisting on less than a dollar a day. One out of every six adults is HIV positive or has AIDS. More than 700,000 children have lost one or both parents to the disease.

At Chishawasha, Schoenwiese gave the entire orphanage an introductory lesson in photography, but mainly he worked with a dozen students, ages 11 to 18. He said he chose the most introverted children, to "get them out of their shell." He provided them with 35-millimeter point-and-shoot cameras he bought on eBay, and developed and printed the film at a photo lab in Lusaka. Many of the kids had never used a camera, so there was some initial confusion about which side of the viewfinder to look through, and it was a while, he says, before most of the kids were able to "envision" a picture before creating it. Over three weeks, Schoenwiese gave the kids several assignments, asking them to document their surroundings and to take pictures of friends and family members. They also went on a mini safari at a resort hotel's game preserve, snapping away at elephants and zebras and then lingering by the hotel pool and laughing as they daintily pretended to drink tea out of china cups the waiters hadn't yet cleared away.

The idea of the photography workshop, in part, was to help the kids look at

Wielding cameras bought on eBay, youngsters from an orphanage near Lusaka, Zambia, enjoy an afternoon safari led by Klaus Schoenwiese (opposite, inset) as part of his photography workshop. Opposite, left to right: Nicolas (peering through viewfinder), Thokodzile, Amos, Bobsisa, Charity, Mwewa, Faustina, Charles (standing) and Mary (in cap). In Charles' picture (below), the photographers get in touch with a tame elephant.

their world afresh. Peter, 11, who shepherds goats and likes to build toy cars out of wire, said he loved learning something completely different. Mary, 15, now thinks she wants to be a journalist. "I like the way they inform the world on what is happening in other countries," she said. "And I also hear that journalists speak proper English." Charles, 18, who has a knack for electronic gadgets—he'd rigged up a CD player in his room from discarded old parts—said he would rather be behind the camera than in front of it. Annette, 14, said she hoped that her photographs might someday appear in a magazine (see p. 101). Schoenwiese remembers an intense aesthetic debate with Amos, 13, who really liked a certain photograph he'd taken of a goat. Schoenwiese tried to convince the boy that a different photograph he'd taken of the goat was technically superior—sharper, with better contrast and exposure. Amos was unmoved. "One forgets that in our hyper-visual world these ideas are very subjective," Schoenwiese says.

In another assignment, a Chishawasha student would go to a family member's home, and another student would photograph him with his relatives. Schoenwiese placed those pictures in albums for the kids to keep, part of an effort to add to their meager stock of mementos. "As orphans, many of the students have an incomplete knowledge of or are not quite in possession of their own personal history,"

Above: "I want to be an accountant," says Amos, 13, whose picture of a boy and girl outside Chishawasha has a familiar schoolyard spontaneity. Amos adds, "I have also learned how exciting it is to work with cameras." Right: For a day-in-the-life assignment, Nicolas, 13, photographed his roommate, Henry, 14. Nicolas was so young when his parents died that he doesn't know his mother's name. He says he wants to be a pastor to help people heal.

AMOS CHINDALU / © 2007 KLAUS SCHOENWIESE; NICOLAS BANDA / © 2007 KLAUS SCHOENWIESE

Above: Faustina, 13, whose hobbies are singing, dancing and reading, photographed a shopping mall goldfish pond. Far left: 12-year-old Monica's double portrait shows fellow photography students Annette, 14, and Faustina. Monica says she'd like to work with orphans someday. Left: Charity, 12, documented a Chishawasha caretaker preparing n'shima, a cornmeal porridge, for the students' lunch. Charity has lost both parents and a younger sibling to AIDS.

FAUSTINA KUMUENDA / © 2007 KLAUS SCHOENWIESE; MONICA PHIRI / © 2007 KLAUS SCHOENWIESE; CHARITY NDULUVU / © 2007 KLAUS SCHOENWIESE

Schoenwiese says. "They were especially eager to see their own presence and immediate relationships reflected in photographs." The kids went through the album pages in awe, recalls Mary Hotvedt, Chishawasha's development director. "With all the loss and prevalence of death in Zambia," she says, "these photos showed the kids that they really matter, that they really exist."

At the end of the workshop, the school exhibited 250 of the kids' pictures in a large classroom. More than 100 people showed up to gaze at the mounted 4-by-6-inch prints, many pinned from clotheslines. "The kids had a new way of seeing their families," Hotvedt says. "You could see how proud they were to say 'these are my people.'"

Schoenwiese features the students' work in an online gallery (tribeofman.com/zambia), and he's planning to sell prints of the students' work to support future photography workshops at Chishawasha. He's been a professional photographer for nearly two decades, but he says the youngsters—whose jubilant farewell party for him included dancing, singing, drumming and poetry—opened *his* eyes. "Despite their difficult past and their most certainly challenging future," he says, they "have an especially wonderful ability to live in the present. In that they have taught me plenty."

JESS BLUMBERG, *a* SMITHSONIAN *intern, is from Baltimore.*

Above: Boys will be boys, this picture of kids hiding toys at Chishawasha by Peter, 11, seems to say. Opposite, clockwise from top left: 13-year-old Bobsisa, who crafted a portrait of an unnamed Lusaka resident, says he might want to become a journalist; Annette caught fellow student Charity (center) with Charity's brother and his wife; outside a Lusaka shop, hip-hop fashion reigns, suggests 13-year-old Mwewa; the Chishawasha garden glows at sunset in a picture by Mary, 15, a five-year Chishawasha resident; this portrait of Mary herself is by Thokodzile, 17, who has lived in the orphanage since it opened in 2001.

PETER SAKALA LUNGHU / © 2007 KLAUS SCHOENWIESE

BOBSISA SAUBATELI / © 2007 KLAUS SCHOENWIESE; ANNETTE BANDA / © 2007 KLAUS SCHOENWIESE; THOKODZILE KAUMA / © 2007 KLAUS SCHOENWIESE; MWEWA MWAWBA / © 2007 KLAUS SCHOENWIESE; MARY PAXINA MAKUNKA / © 2007 KLAUS SCHOENWIESE

For additional images, visit Smithsonian.com/zambia.

Galloping Ghosts

DURING THE ICE AGE, when glaciers blanketed northern Europe and a wind-ripped tundra stretched down to the Mediterranean countryside, thick forests and fertile meadows gave refuge to the wild horses that roamed the Central European lowlands, browsed the East European steppes and galloped across Asia and the Americas. In the fifth century B.C., Herodotus wrote of how much he enjoyed watching herds grazing in the bogs and marshes of what is now Poland. For ages, these horses, called tarpans, outwitted hunters and survived, but by the 18th century not many remained, in part because diners prized tarpan meat—it was sweet, but more appealingly, it was scarce—and in part because tarpans had interbred with farm horses to produce fertile offspring. In 1879, pursued by humans, the last wild, pure tarpan mare fell down a crevasse in Ukraine and died; the last captive died eight years later in a Moscow zoo.

At that point the species officially became extinct, just one more chapter in the annals of life on earth. Yet in Bialowieza, a forest straddling the border between Belarus and Poland, tarpans apparently still graze.

The animals that roam Poland's Bialowieza forest (right) recall those drawn in the Cave of Lascaux in France (below left) some 17,000 years ago. Tarpans, as the ancient equines of Europe were known, appeared in a British encyclopedia in the mid-1800s (below) but disappeared from the planet in 1887. Later, a Nazi biologist started experimenting.

In Poland's primeval forest, a Nazi scientist re-created an extinct breed of horse. Or did he?

BY DIANE ACKERMAN

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Bialowieza also played a role in the rescue of the European bison from extinction. But that effort, which helped kindle Poland's conservation movement, came after the Nazi occupation.

BIALOWIEZA (pronounced bya-woe-VYE-zha) is the only fragment of primeval lowland forest preserved in all of Europe, an ecosystem Poles call a *puszcza*, a word evoking ancient woodlands undefiled by man or woman. Historically, it served as a hunting retreat for kings and czars (who kept an ornate lodge there), but by World War II, it had fallen under the purview of scientists, politicians and poachers. The rapid decline of the largest land animals in Europe—European (or "forest") bison—helped to kindle Poland's conservation movement after the war.

In a small reserve at the edge of the woods, time seems to evaporate as a herd of horses graze on marsh grass beneath colossal pine trees and a dazzling blue sky. On frosty mornings, they browse inside bubbles of steam and leave a sweet leathery odor behind them, invisible clouds above jumbled hoofprints. Spring through fall, the horses live unaided by humans, wading in the ponds and grazing on bushes, tree branches, algae and grass. In winter, they paw the snow to find dry grass or rotting apples, and rangers of the mounted Horse Guard sometimes provide hay and salt; well-muscled, the horses have little fat to insulate them, so they grow shaggy, easily matted coats. It is then that they most resemble the horses painted on the cave walls at prehistoric sites throughout France's Loire Valley.

They're strikingly beautiful creatures: dun with a black stripe down the back and a dark mane. Although they have long ears and large, thick necks, they are lightly built and fast. Unlike more domestic horses, their coats lighten in winter, just as those of ermine and arctic hares do, blending in with the landscape. Then ice clots like marbles in their manes and tails. Still, they thrive on harsh weather and poor diet; and, although the stallions battle fiercely, with bared teeth and thwacking necks, they heal quickly.

How did these lost-in-time animals get here?

FOR YEARS LEADING UP to World War II, German zoologists pursued a fantastic goal: the resurrection of extinct species. Genetic technologies wouldn't emerge until the 1970s (and in any event remain insufficient for this purpose), but one such zoologist, Lutz Heck, decided to use a traditional method of breeding animals to emphasize specific traits. Heck's reasoning went like this: even an extinct animal's genes remain in the gene pool of closely related living species, so if he concentrated the genes by breeding animals that most resembled their extinct antecedents, in time he would re-create their ancestral forms. He was wrong—not all the genes survive, so extinct species cannot be revived through breeding—but the war gave him an excuse to loot East European zoos for the best specimens to mate with several wild strains, hoping to breed back to pure "Aryan" animals the fierce creatures painted in ocher on Cro-

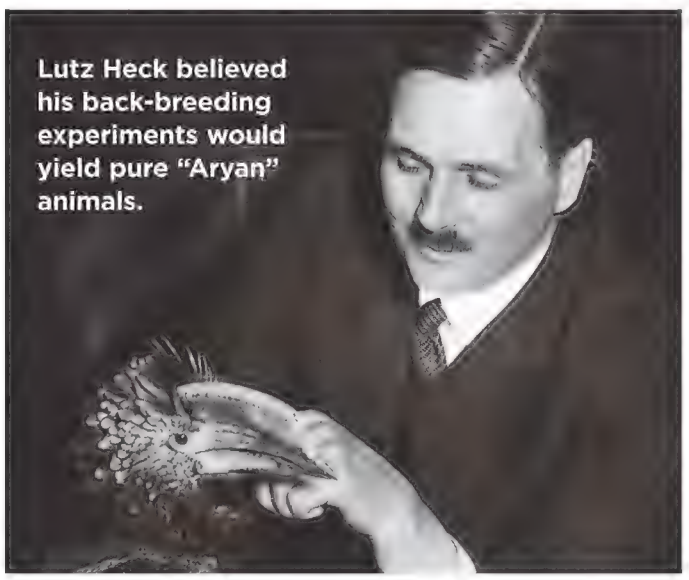
Adapted from *The Zookeeper's Wife*, by Diane Ackerman. Copyright © 2007 by Diane Ackerman. With the permission of the publisher, W.W. Norton & Co., Inc.

KLAUS NIGGE PHOTOGRAPHY; MAP: MIKE REAGAN; P. 102 GRANGER COLLECTION, NEW YORK; PHOTOLIBRARY; PP. 102-103 R. & M. KOSINSKI / WWW.KOSINSCY.PL

Historically a hunting ground for royalty, Bialowieza remains unspoiled by human habitation. In addition to its throwback tarpans, the forest hosts a multitude of other species (including wild garlic).

Magnon caves. What better totems for the Third Reich?

Before the war ended, Heck shipped back many of his back-bred, look-alike tarpans to idyllic Bialowieza, where he pictured Adolf Hitler's inner circle hunting in the new millennium. After the war, the care and breeding of the animals, and the stewardship of Poland's part of the forest, returned to Polish hands.



Lutz Heck believed his back-breeding experiments would yield pure "Aryan" animals.

What is so awe-inspiring about this landscape that it could bewitch people from many cultures and eras? For starters, it contains 500-year-old oak trees, as well as soaring pine, spruce and elm rising like citadels hundreds of feet tall. In addition to its throwback tarpans, it boasts a multitude of other species, from one-celled protozoans to boar, elk, lynx, wolf, moose and bison. Beavers, martens, weasels, badgers and ermine glide through the marshes and woods, while Pomeranian eagles share the skies with bats, goshawks, tawny owls and black storks. The air smells of balsam and pine needles, sphagnum moss and heather, berries and mushrooms, marshy meadows and peat bogs. Small wonder the preserve has been named a World Heritage site.

Because it is closed to hunters, loggers and motorized vehicles of any sort, the preserve is the last refuge of unique flora and fauna. Park rangers guide tiny groups of hikers along designated paths, where they're forbidden to litter, smoke or even speak above a whisper. Nothing may be removed. If a ranger needs to carry something into the park, he transports it by rubber-tired horse cart; if he needs to move a fallen tree, he uses a handsaw and workhorses.

Ironically, the breeding experiments that thrived with Heck's ambitions helped to save scores of rare plants and endangered animals. But understandably bitter about Heck's Nazi ties and motives, Polish patriots were (and still are) quick to point out that these "tarpans" are technically counterfeits, like the descendants of the Heck-bred aurochsen, or wild oxen, on display elsewhere in Europe. Some zoologists, who prefer to speak of "near-tarpans" and "near-aurochsen," associate the animals with political agendas. They paint Heck as a con man who staged a colossal Nazi hoax by creating new breeds, not resurrecting extinct species. But Herman Reichenbach, in *International Zoo News*, envisions an important role for the pseudo-throwbacks: "They can still help preserve a natural environment of mixed forest and meadows. . . . And as a feral type of cattle, the aurochsen may also be able to enhance the gene pool of a domestic animal that has become impoverished genetically."

There are many forms of obsession, some diabolical, some fortuitous. Strolling through Bialowieza's mass of life, one would never guess its political dramas, including the role it played in Nazi ambitions.

DIANE ACKERMAN *has published several nonfiction books, including the best seller* A Natural History of the Senses.

R. & M. KOSINSKI / WWW.KOSINSCY.PL; ULLSTEIN BILD / GRANGER COLLECTION, NEW YORK; P. 107 LIZ BOMFORD / PHOTOLIBRARY

Fighting—with bared teeth—is common among the stallions. Meanwhile, the origins of the herd have spurred antagonisms among zoologists, with some calling the animals "near-tarpans" and associating them with a political agenda.

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Who's Fueling Whom?

Why the biofuels movement could run out of gas

BY RICHARD CONNIFF

MITSU YASUKAWA / STAR LEDGER / CORBIS; ROBERT SULLIVAN / AFP / GETTY IMAGES

I FIRST STARTED TO THINK that the biofuels movement might be slipping into la-la land when I spotted a news item early this year about a 78-foot powerboat named *Earthrace*. In the photographs, the boat looked like a cross between Howard Hughes' *Spruce Goose* and a Las Vegas showgirl. Skipper Pete Bethune, a former oil industry engineer from New Zealand, was trying to set a round-the-world speed record running his 540-horsepower engine solely on biodiesel.

Along the way, he spread the word that, as one report put it, "it's easy to be environmentally friendly, even in the ostentatious world of powerboating."

Well, it depends on what you mean by "easy." Bethune's biodiesel came mostly from soybeans. But "one of the great things about biodiesel," he declared, is that "it can be made from so many different sources." To prove it, his suppliers had concocted a dollop of the fuel for *Earthrace* from human fat, including some liposuctioned from the intrepid skipper's own backside.

Given the global obesity epidemic, that probably seemed like a sustainable resource. You could almost imagine NASCAR fans lining up for a chance to personally power Dale Earnhardt Jr.'s Chevy Monte Carlo into the tunnel turn at Pocono.

But biofuel skeptics were seeing warning flags everywhere.

Over the past few years, biofuels have ac-

Boom times: diesel from soybeans (above) at a New Jersey plant that opened in February; Pete Bethune (left) and his biofueled boat, before hull damage cut short his try at a speed record.

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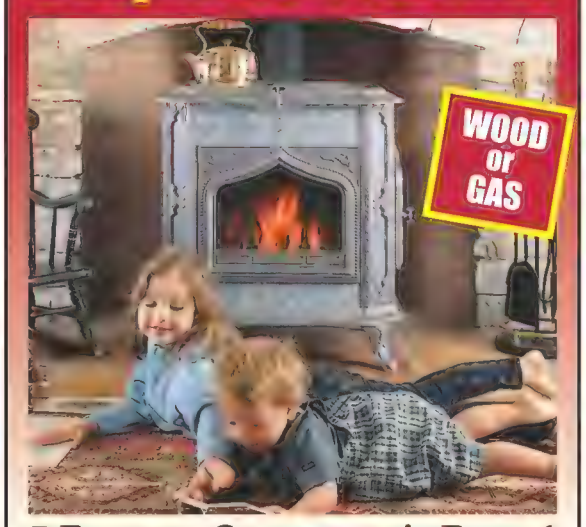

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quired an almost magical appeal for environmentalists and investors alike. This new energy source (actually as old as the first wood-fueled campfire) promises to relieve global warming and win back America's energy independence: instead of burning fossil fuels such as coal or oil, which fill the atmosphere with the carbon packed away during thousands of years of plant and animal growth, the idea is to extract energy only from recent harvests. Where we now pay larcenous prices to OPEC, we'd pay our own farmers and foresters instead.

Of course, biofuels also produce carbon dioxide, which is the major cause of global warming. But unlike fossil fuels, which don't grow back, corn, soybeans, palm oil, grasses, trees and other biofuel feedstocks can recapture, through photosynthesis, the massive quantities of carbon dioxide they release. This makes biofuels seem like a good way to start bringing the carbon ledger back into balance. Other factors have made the promise of biofuels even more tantalizing.

- Ethanol producers in this country receive a tax credit of 51 cents a gallon, on top of billions of dollars in direct corn subsidies. (In 2005, the most recent year for which figures are available, it was $9 billion.) In Europe biodiesel subsidies can approach $2 a gallon.
- Some biofuel entrepreneurs are coining energy, and profits, from stuff we now pay to get rid of: methane from municipal dumps, wood chips piling up around sawmills, manure from livestock facilities, and paper-mill sludge that now usually ends up being trucked to a landfill.
- With a little planning, proponents say, biofuels could give us not just energy but wildlife too. Switchgrass and other potential feedstocks provide good habitat for birds and other animals between harvests.

All this, and in the minds of people like Pete Bethune, we get to keep our muscle boats too.

SO WHAT'S THE HITCH? Partly it's that bit about doing a little planning.

With biofuel production increasing, demand for corn is growing (far right, the Chicago Board of Trade's corn futures pit)—and so is the cost (right, a Mexico City protest against rising tortilla prices).

The move to biofuels thus far looks more like a stampede than a considered program to wean ourselves from fossil fuels. Critics in the financial community have used words like "gold rush" and even the dreaded "bubble," fretting that "biofool" investors are putting too much money into new refineries, which could go bust as markets and subsidies shift or as technologies and feedstocks become obsolete.

Betting the farm on biofuels has become commonplace: this year alone American farmers planted an additional 15 million acres in corn, and they were expecting one of the largest harvests in history. The share of the corn crop going into ethanol is also increasing pell-mell, from about 5 percent ten years ago to 20 percent in 2006, with the likelihood that it could go to 40 percent in the next few years.

Not surprisingly, the price of corn doubled over the last two years. This past January, angry consumers took to the streets in Mexico City to protest the resulting surge in the price of tortillas, a staple food. In China, rising feed costs boosted pork prices 29 percent, prompting the government to back off its plan to produce more biofuels. Even titans of agribusiness worried out loud that we might be putting fuel for our cars ahead of food for our bellies.

The chief executive at Tyson Foods said the poultry producer was spending an extra $300 million on feed this year and warned of food-price shocks rippling through the market. Cargill's chief predicted that reallocation of farmland due to biofuel incentives could combine with bad weather to cause food shortages around the world. Cattle ranchers and environmentalists, unlikely bedfellows, both called for rethinking those incentives.

Not that anybody seems to have given them much thought in the first place. One problem with current subsidies is that they act as if all biofuels were created equal—while some may actually be worse for the environment

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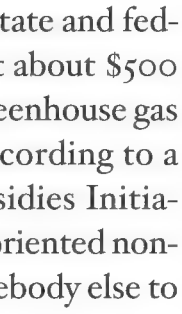

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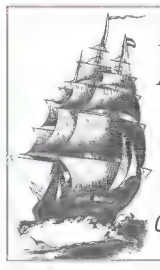

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than conventional gasoline. For instance, corn ethanol on average produces about 13 percent less greenhouse gas emissions than gasoline, according to Daniel Kammen, a public policy professor at the University of California at Berkeley. But when ethanol refineries burn coal to provide heat for fermentation, emissions are up to 20 percent worse for the environment than gasoline. Yet that ethanol still earns the full subsidy.

In the United States, state and federal biofuel subsidies cost about $500 for every metric ton of greenhouse gas emissions they avoid, according to a study by the Global Subsidies Initiative, an environmentally oriented nonprofit. We could pay somebody else to reduce their greenhouse gas emissions, via the European carbon emissions trading market, for about $28 a ton.

But don't biofuel subsidies buy us energy independence? President Bush, a former oil executive, declared last year that we are "addicted to oil." In this year's State of the Union speech, he set a national goal of producing 35 billion gallons of alternative fuels by 2017. The next morning, C. Ford Runge, who studies food and agriculture policy at the University of Minnesota, calculated that this would require 108 percent of the current crop if it all came from corn. Switching to corn ethanol also risks making us dependent on a crop that's vulnerable to drought and dis-

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ease. When the weather turned dry in the Southeast this summer, for instance, some farmers lost up to 80 percent of their corn.

In a recent *Foreign Affairs* article, "How Biofuels Could Starve the Poor," Runge and co-author Benjamin Senauer noted that growing corn requires large amounts of nitrogen fertilizer, pesticides and fuel. It contributes to massive soil erosion, and it is the main source, via runoff in the Mississippi River, of a vast "dead zone" in the Gulf of Mexico. (This year the dead zone, expanding with the corn crop, was the third-largest on record.) The article made the switch to corn ethanol sound about as smart as switching from heroin to cystal meth.

Biofuel subsidies might make sense, other critics say, if they favored "cellulosic" ethanol instead—fuel that comes from breaking down the cellulose in the fibrous parts of the plant, such as the corn stalk instead of the kernel. That wouldn't put direct pressure on food prices, and might even reduce them by providing a market for agricultural waste products. Cellulosic technology is also the key to exploiting such nonfood plants as switchgrass, and it promises an improvement of more than 80 percent in greenhouse gas emissions compared with conventional gasoline. But while an experimental cellulosic ethanol plant is now operating in Canada, and several others are being built in this country, most experts say it will take years for the technology to become economically competitive. There are also political realities. "Corn and soybean interests haven't spent 30 years paying campaign bills" for national politicians, says Runge, "to give the game away to grass."

EVEN IF cellulosic ethanol becomes practical, biofuels will provide at best only part of the solution to the problems of global warming and energy supply. That's because biofuels will never match the one thing fossil fuels do brilliantly: concentrating solar energy. A gallon of gasoline represents the

power of the sun gathered up and locked away by about 196,000 pounds of plants and animals. To produce all the petroleum, coal and natural gas on earth, it took an entire planet's worth of plants and animals growing and dying over about 700 million years.

Switching to biofuels means getting our energy only from what we can grow in the present day, and that's not much. In the course of a year, an acre of corn yields only as little as 60 gallons of ethanol, after you subtract the fossil fuels used to cultivate, harvest and refine the crop.

So let's flash forward five years. Twice a month you swing by the biofuels station to fill the 25-gallon tank in your sporty flex-fuel econo-car. (Pretend you've kissed the SUV goodbye.) Even this modest level of energy consumption will require a ten-acre farm to keep you on the highway for a year.

That might not sound too bad. But there are more than 200 million cars and light trucks on American roads, meaning they would require two billion acres' worth of corn a year (if they actually used only 50 gallons a month). The country has only about 800 million acres of potential farmland.

What if we managed to break out of the corn ethanol trap and instead set aside 100 million acres for high-yielding cellulosic ethanol crops? That's an attractive option to almost everyone outside the corn industry, including such environmental groups as the Natural Resources Defense Council. But it would still produce only about an eighth of the nation's projected energy consumption in 2025, according to a University of Tennessee study.

ONE OTHER PROBLEM with the rush to "greener" fuels is that, despite the biodiversity happy talk, wildlife is already prominent among biofuel victims. Last year, for instance, farmers were protecting about 36 million acres through the U.S. Department of Agriculture's Conservation Reserve Program (CRP), which works to restore de-

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graded lands, reduce soil erosion and maintain wildlife habitat. CRP land is what biofuel proponents often have their eyes on when they talk about producing biofuels and biodiversity by growing switchgrass. But farmers look at the bottom line, sizing up the $21 per acre they net with the CRP payment (to take a representative example from southwest Minnesota) against the $174 they can now earn growing corn. And they have begun pulling land out of CRP and putting it back into production.

Other countries are also rapidly surrendering habitat to biofuel. In Indonesia and Malaysia, companies are bulldozing millions of acres of rain forest to produce biodiesel from oil palm, an imported species. The United Nations recently predicted that 98 percent of Indonesia's forests will be destroyed within the next 15 years, partly to grow palm oil. Many of the new plantations will be on the island of Borneo, a mother lode of biological diversity.

Apart from the effect on wildlife, critics say Indonesia's forests are one of the worst places to grow biofuels, because they stand on the world's richest concentration of peat, another nonrenewable fuel. When peat dries out or is burned to make way for a plantation, it releases huge quantities of carbon dioxide. Indonesia, despite its undeveloped economy, already ranks as the world's third-largest source of greenhouse gas emissions, after China and the United States. When you add the peat effect into the equation, according to the conservation group Wetlands International, Indonesian palm oil biodiesel is up to eight times worse for the environment than gasoline.

Oh, and one final irony. The *Christian Science Monitor* recently reported that because of the way U.S. biofuel laws are written, foreign tankers loaded with Indonesian biodiesel can stop briefly at an American port, blend in a splash of regular petroleum diesel and qualify for a U.S. subsidy on every gallon. It's called "splash and dash," because the tankers generally push on to Europe to collect additional subsidies there. All in the name of greener fuels.

NONE OF THIS MEANS we should give up on biofuels. But we need to stop being dazzled by the word and start looking closely at the realities before blind enthusiasm leads us into economic and environmental catastrophes. We also should not let biofuels distract us from other remedies. Conservation and efficiency improvements may not sound as sexy as biofuels. But they are typically cheaper, faster and better at dealing with the combined problems of global warming and uncertain energy supply. They also call on what used to be the defining American traits of thrift and ingenuity.

And what about Pete Bethune, gallivanting around the planet in his powerboat and telling us it's easy to be environmentally friendly in this newfangled world? I think he must be kidding. Our brief infatuation with biofuels has already taught us, with every high-priced tortilla, that there is no such thing as a free lunch.

RICHARD CONNIFF, *a longtime contributor to the magazine, is a 2007 Guggenheim Fellow.*

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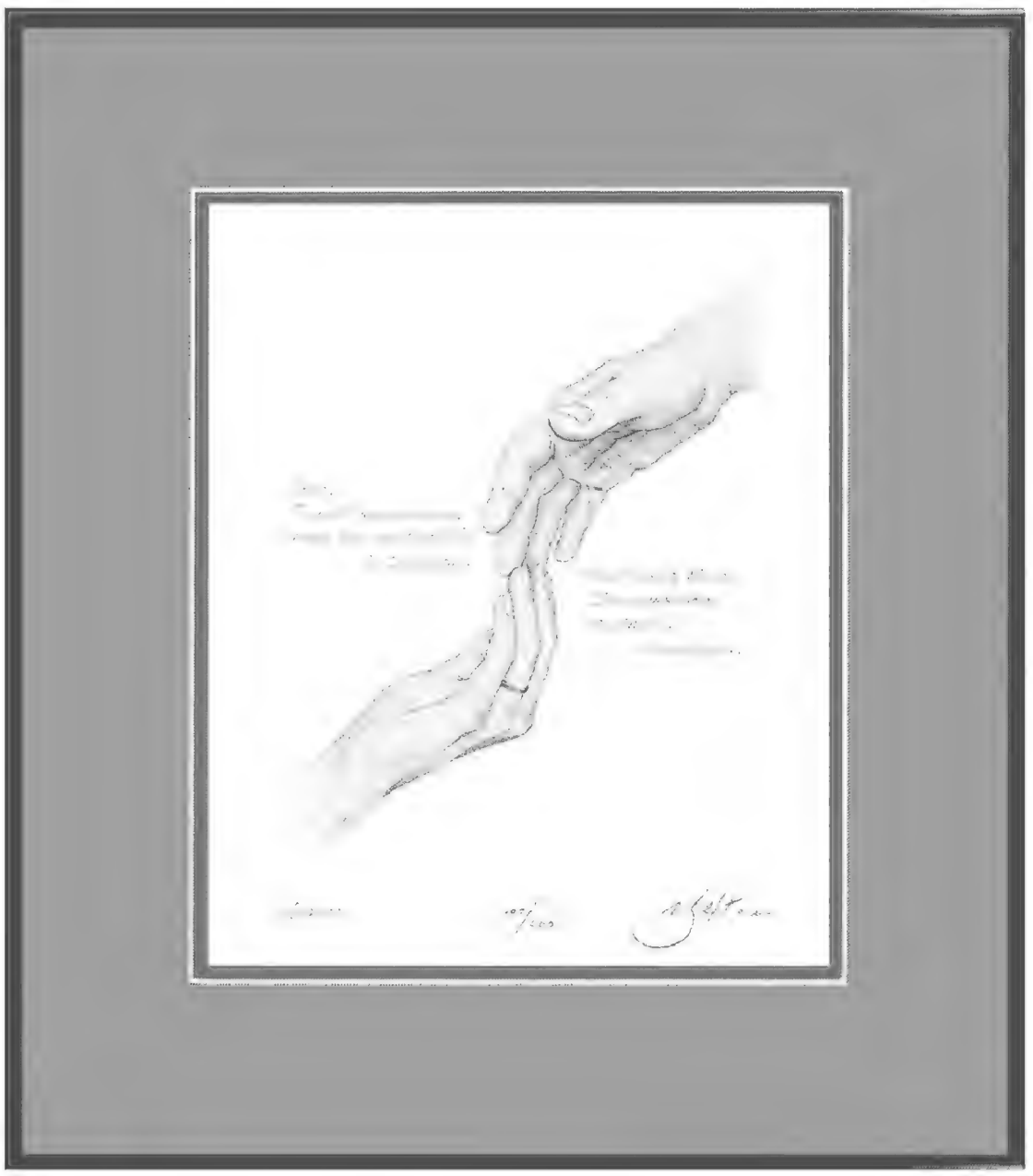

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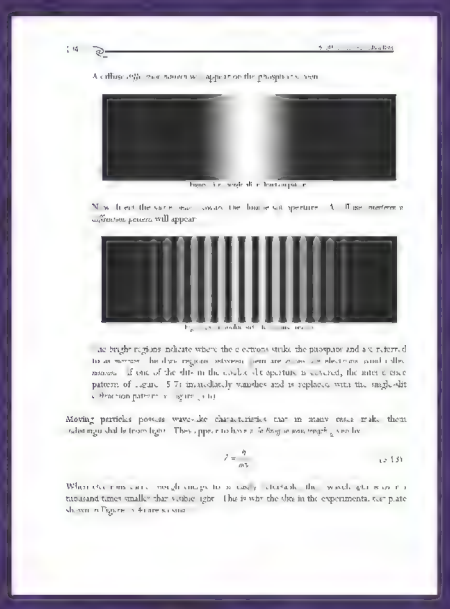

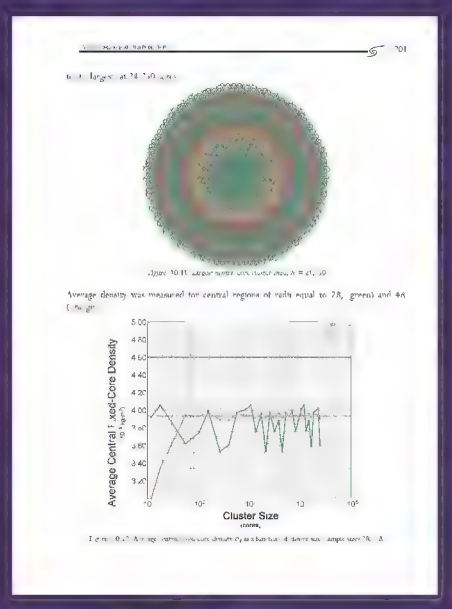

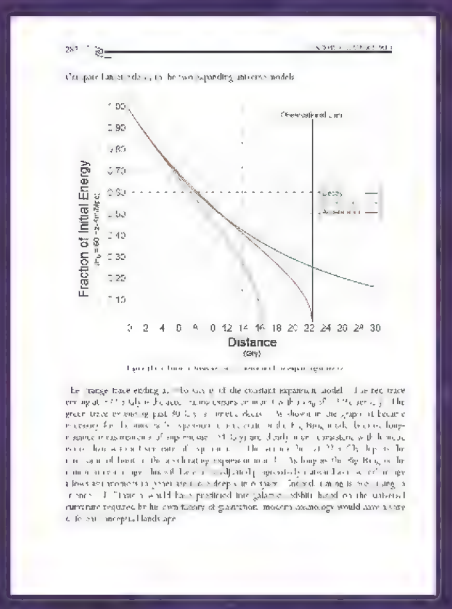

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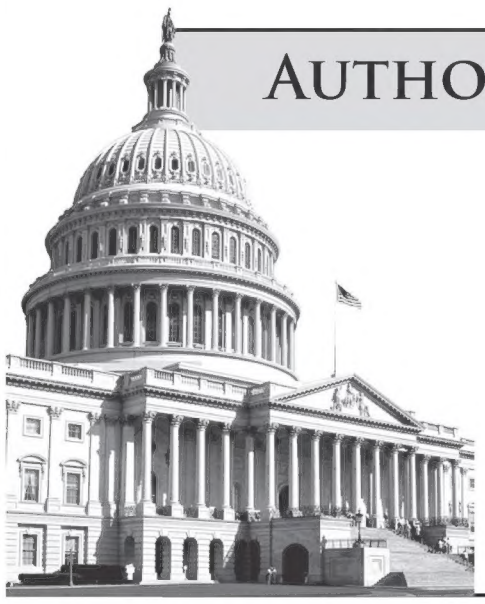

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Dr. Richard Wolfson (Ph.D., Dartmouth College) is Professor of Physics at Middlebury College in New England. Decades of teaching at Middlebury, with its strong emphasis on the humanities, have made him an expert at demonstrating the logic and significance of physics to students from many fields. His writings have appeared in *Scientific American*. He is author of *Physics for Scientists and Engineers*.

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Turning a New Leaf

The story of one man's fall **BY BOB BALMER**

MY FRIEND ALICE and I stood on some boulders overlooking the North Fork of the Santiam River in Oregon. Below us the water pooled, then trickled through a fissure and into the Santiam's whitecapped channel.

Moss, boulders, water, blue skies and treetops bronzed with autumn light—nature looked fine that day. But not as fine as it would in a few weeks, when red, orange and yellow leaves would dapple its green attire. Still, the light was enough to inspire me to recite poetry. My brain, crowded with appointments, lists and papers to grade, got as far as, "Two roads diverged in a yellow wood. . . . "

Unable to proceed any further down either road, I said, "I can't wait for a cold snap to turn the leaves. Imagine gold, red and orange scattered among the evergreens."

Alice squinted and said, "The cold doesn't turn the leaves; the lack of daylight does."

As an English teacher, I should know better than to dip my toe into the pond of science. It leaves no room to say, "Well, that's my interpretation." Instead, being male I said, "I think you're wrong."

Alice and I had unwittingly entered the land of inane disputes, a realm I inhabit so often I could claim citizenship. One evening a friend and I argued till 2 a.m. over who was the better guitarist, Eric Clapton or Carlos Santana. (I still say Santana, on the basis of *Supernatural.*) A former girlfriend and I squabbled over the difference between medium rare and rare roast beef. (She said—and I'm not kidding—that medium rare meant red in the middle; I said red equals rare. When I called my mother, who hates conflict, she said: "You both have a point.") Every other week my wife and I argue over her need to clean the house the night before the cleaning lady comes to clean the house.

After a final glance at the amber light crowning the firs, Alice and I trudged to her car in silence. For me, the question of whether cold or light causes the leaves to turn became the guest who wouldn't leave. Walking to the store I would think: leaves. I would read about Tiger Woods and think: leaves. We got a notice for the leaf cleanup on our street and I thought: cold or light? To rake the leaves from my mind, I Googled: *leaves turning/cause*.

To paraphrase Robert Frost: two notions diverged in the woods, and I chose the one that was . . . wrong. "The timing of color change and leaf fall are primarily regulated by the calendar, that is, the increasing length of night," I read on a National Forest Service Web site. When I told Alice she was right about leaves, she said, "Oh. I'd forgotten about that."

Who won the first Super Bowl? How many horsepower in the 1965 Mustang? Who wrote "Wichita Lineman"? These are questions a man might ask Alice after losing a debate about leaves, for when a man is wrong, he promptly searches for something to be right about. And I did. While Googling *leaves turning/cause*, I stumbled across a scholarly paper titled "Cold-Induced Photoinhibition Limits Regeneration of Snow Gum at Tree-Line." The paper provided minutiae that I am storing for the next time Alice and I go hiking. Somewhere on a rocky trail I plan to ask, "Do you know why there's a limit to regeneration of snow gum at the tree line?"

I can just see Alice shaking her head. I can hear her baffled, "What?" I nod yes, and with measured calm explain, "Well, it's because cold-induced photoinhibition limits regeneration of snow gum at the tree line." But first, because Alice asks a lot of questions, I'd better Google snow gum and find out what the heck that is.

RICHARD THOMPSON